Annual N. E. L. A. Convention Number—President Lloyd on the Influence and Field of the Association—Growth and Practice of the Commonwealth Edison Company.

Electrical World

Volume 67 Number 21 McGraw Publishing Co., Inc. New York, May 20, 1916

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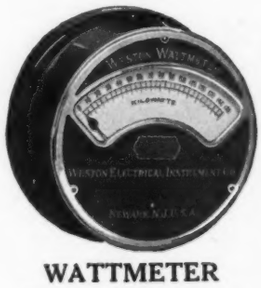

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Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by McGraw Publishing Company, Inc.

Vol. 67 NEW YORK, SATURDAY, MAY 20, 1916 No. 21

A Constructive Policy in the N. E. L. A.

GENERATING and marketing electrical energy is a remarkable business—unusual because it includes problems and policies of engineering, operating, sales, administration and management. Many enterprises include making and selling, but in no other are engineering and commercial problems so interwoven with questions of broad public policy and business development. As a consequence of this condition the work of the National Electric Light Association has not only to cover the specialized problems in the fields of engineering and selling and administration but the co-ordinating principles of general management and public policy. A review of the program of the thirty-ninth annual convention to be held in Chicago next week emphasizes the tendencies in growth and development and indicates lines of future activity of the greatest importance. The specialized features may be grouped under four heads of almost equal importance—first, the generation and distribution of electrical energy to be sold; second, the widening of the application of electricity and the sale of energy and appliances; third, problems of individual company administration; and, fourth, the broader questions of management and public policy. These closely follow the departmental lines in the average central station company whether large or small and they concern the work of each individual.

SPECIALIZATION must necessarily characterize the first three of the problems stated. In the technical and hydroelectric sessions, in the commercial and electric vehicle meetings and in the accounting sessions special detail reports will present the summarized practice of different organizations. There is great strength in such specialized treatment of detailed problems, for by this means all sides of an issue can be correctly analyzed and discussed. But there is also a weakness; the specialist may be so immersed in his particular investigation that he overlooks the relations of that problem to the whole. At the time of this most important convention it is well to emphasize the need of co-ordination as well as of specialization. Some of the sessions labeled "technical" should be attended by commercial men, and similarly many commercial meetings are quite as suggestive to the technical men of every department.

SPECIAL conferences called by President Lloyd during the year indicate the strength of the growing feeling within the member companies that co-ordination of effort along broader lines is demanded. The association cannot neglect the specialized activities. It has grown in the same way that the individual companies comprising it have prospered. It is comparable with a commercial enterprise. When such a business is small, the man who starts it knows all sides. As the enterprise grows he must of necessity put other men in charge of his departments. These men become specialists. The head of the business must then establish policies and co-ordinate the work of the departments. Committees and sections of the association in a somewhat analogous way have specialized and developed. The past year, as is emphasized by the leading article by President Lloyd in this issue, has seen a better co-ordination and a more definite sense of direction in the work of the association as a whole. Growth, the distinctive requirements of the individual member and company, varied activities reflected by the program, these considerations make the work of amalgamation an insistent problem. Some lines of activity progress more rapidly than others. Necessarily development in the different departments of the association is uneven. The very fact that there has been progress in this direction is a promise for the future.

THIS outstanding quality in the year's work is highly commendable. Nothing is more vital to the success of the properties than a full understanding of the obligations imposed by the fourth class of the problems stated above, namely, the broad questions of management and public policy. Problems of rate-making, of valuation, of the questions of public policy in general which face the central station cannot be disregarded. These problems are to be solved with local conditions in mind, but there can be no book of rules to fit all cases. At least, however, there can be established and recognized a uniform procedure in treating the details of some of the questions involved. By co-ordinating and carrying out the broad plans which it is well-equipped to establish, the association will give constructive guidance to the advancement of the entire industry.

THE EVER-EXPANDING ACTIVITIES OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION

Impressions of the Tremendous Extent of the Business and Intelligence and Co-operation of Employees of Member Companies—The Need of Work, Funds and Willing Members to Capitalize Opportunities

By E. W. LLOYD, President

THE impressions received from holding the office of president of this association are the tremendous extent of our business and the high-class of the intelligence of the employees of our members and their willingness to co-operate in every way in making the business a success and in giving to others any expert knowledge they have gained.

PRESIDENT LLOYD

Every president must be impressed with his inability to cope with all problems needing attention. This in itself seems to demand that a staff at headquarters be engaged to take care of every possible contingency. It has been emphasized to me that we should have much closer relations with other electrical associations, also that more of the central station companies should take an active part in our affairs. There is no question of the complete co-operation of those men who have been accustomed to spending time for the good of the association, but we need more men representing wider territory.

One of the difficulties is to secure a succession of men willing to give time to our work. The factor of distance prohibits frequent attendance at committee meetings. However, it is quite remarkable when we consider the large amount of traveling done by the membership and the willingness of the different companies to contribute time and money to the work.

MAGNITUDE AND STRENGTH OF INDUSTRY

A close association with the society impresses one with the magnitude and strength of the industry. One cannot help but be impressed with its spirit of progressiveness. In other words, it is a live business, thoroughly prepared to handle all emergencies. Necessarily there are weaknesses in such a large association, largely because of lack of funds to carry on much work that confronts us. It is now impossible to have a staff available for the membership who are able to take care of all contingencies, but there seems to be an awakening to the fact that these activities cost money, and in the future I am sure the necessary money will be provided to do what is necessary.

A MOMENTOUS YEAR

The past year of the National Electric Light Association has been a momentous one, partially for the reason that during this period we have passed from uncertain times to very good times. The period of doubt in the early part of the administration year was succeeded by the resumption of business on a very prosperous scale during the past eight months.

So far as conditions would permit it has been the policy of the association to carry out the recommendations of previous administrations. This policy has not been deviated from this year. An examination of the last pages of the monthly *Bulletin* indicates that many important committees have been continued. The development of the art has increased the number of subjects to be considered and has also expanded the activities of some of the old committees.

Probably the notable thing of the year has been the determination of the association to expand its activities to take care of the increas-

ing demands of its membership. Problems of the industry have multiplied, due to the regulation feature injected into our affairs by the formulation of a large number of state commissions. The activities of the commissions have brought to the members the necessity for a closer examination into the economics of the business.

The public policy committee has recognized this situation by calling two conferences which have been well attended and which I am sure will ultimately result in good to the industry. These conferences were a successful innovation and undoubtedly committees will be formed next year to carry out the ideas there suggested. The necessity for examination into the more important phases of central station development has had the attention of this committee, which will undoubtedly take steps to meet the conditions.

The activities of the Bureau of Standards in the endeavor to develop rules covering construction and regulation of our business for the use of state commissions have resulted in numerous conferences between our expert committees and this bureau, resulting in a clearer understanding of the situation, and a reasonable formation of such rules will undoubtedly be the result.

WORK OF THE ASSOCIATION

It seems to be the consensus of opinion that the activities of the association should be expanded in several directions. We have had the pleasure of affiliating with us the Electric Vehicle Association as a section. We have strengthened our organization in a similar way in another direction by combining with our forces the Industrial Heating Association, which has become a part of the Commercial Section. We have completed the formation of the Technical and Hydroelectric Section and provided the machinery for the Manufacturers' Section.

Our committee on geographic sections has been very busy outlining plans whereby states or groups of states can get together as sections of the association for the handling of local affairs. I am sure that this will bring about great good to the association in the future. Fortunately, through the fact that the president has been able to visit several of the geographic sections, a better understanding has resulted with regard to their relations to us and without question this will mean a closer co-operation in the future.

All of the activities of the year will culminate at the convention in Chicago in the form of reports or papers, and if these reports or papers have merit they will undoubtedly have the attention of the future administration, as there are many suggestions and ideas contained in them.

THE MEMBERS WILL GIVE SUPPORT

It seems to me that the industry should be congratulated upon having such a society as a medium for the expression of its activities, and that if all central station operators followed completely the activities of the association they could not help but receive in return many times the sums represented by the annual dues which they pay for its support.

Practically every phase of the industry is covered, or plans have been made to cover it in the near future. As the art develops there will be many changes necessary, but I am confident that the future will show the membership ready and willing to furnish the support.

The N. E. L. A. in Its Thirty-ninth Convention

The National Electric Light Association, which was founded in 1885 with eighty-seven members, now has a total membership enrolled of over 14,700.

It represents to-day 90 per cent of the aggregate capitalization and earnings of the electric central station industry.

The current earnings of the electric central station industry are estimated to be at the rate of $450,000,000 annually.

The capitalization of central station companies is estimated at $3,000,000,000.

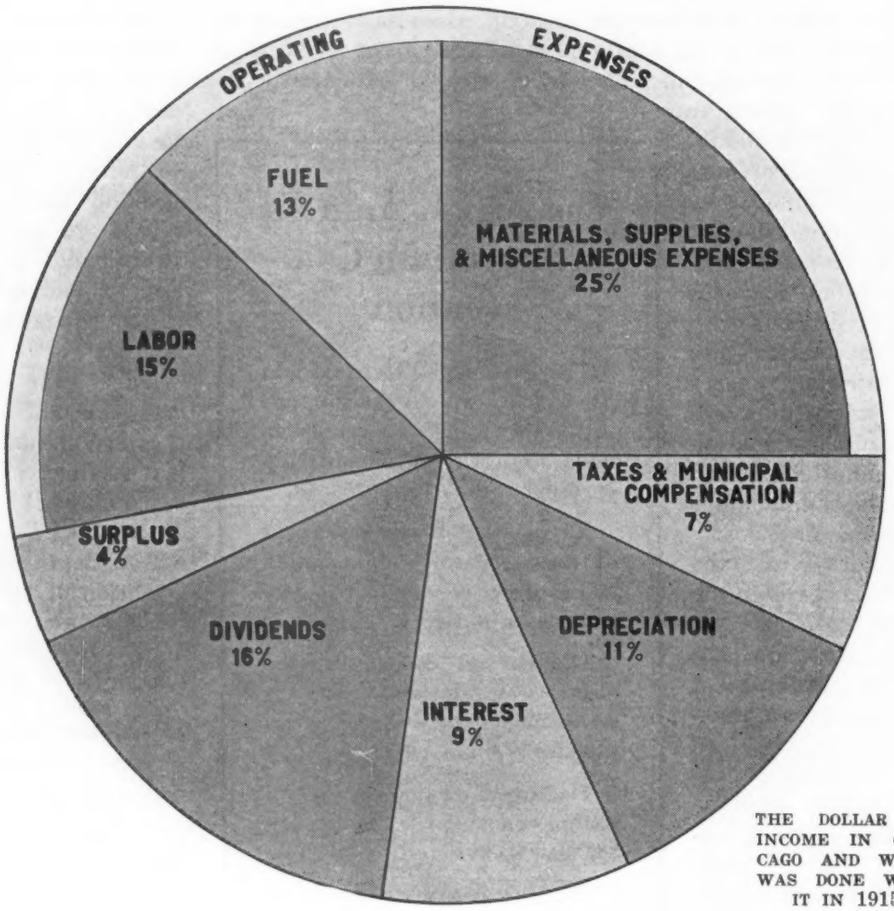
The forthcoming convention in Chicago is the eighth one held in that city by the association.

During its life the association has had five presidents from Chicago.

THE article which is contributed by Mr. Lloyd is a fitting foreword to the Chicago convention. It describes the impressions left by an active year as chief executive official in the service of the N. E. L. A. President Lloyd finds a strong human side in the affairs of the association and a promise of closer co-operation in the work of the future, which is so important to the continuing welfare of the industry.—Editor.

The Commonwealth Edison Company in the Industry

Growth of the Chicago Property from a Small Organization, Operating Originally in Competitive Territory, to Its Present Capitalization of $90,000,000 and Prominent Position as the Largest Seller of Energy in the World



THE DOLLAR OF INCOME IN CHICAGO AND WHAT WAS DONE WITH IT IN 1915

HISTORICALLY connected with the modest birth of the electrical industry, the great Commonwealth Edison Company of the present day, as the largest electric service supply organization in the world, stands as the most characteristic example of the accepted principles of central station management.

When the Western Edison Light Company was formed in Chicago in 1881, it was not designed to furnish service in that city, but to promote the installation of mainly isolated plants. During the following year it established in Appleton, Wis., a small central station. This plant, although projected later than the Pearl Street station in New York, was placed in actual service at an earlier date than that more ambitious venture, and thus it secured a prominent place in the historical records of the industry. The operation of the Appleton plant, with 250 16-cp. incandescent lamps, was started on Aug. 20, 1882. It was not until Aug. 6, 1888, that the operation of a central station was begun in the location in Adams Street, Chicago, which for many years afterwards was the main office of the Chicago Edison Company. The original company, The Chicago Edison Company, was chartered in Illinois on April 27, 1887, with $500,000 capital stock to succeeed the earlier Western Edison Light Company, which had received a twenty-five-year franchise from the city. The successor corporation arranged for a contract with the Edison Electric Light Company of New York and proceeded to carry out the obligations of these two transactions.

Samuel Insull entered the Chicago situation in 1892, when he was elected president of the company. The capital stock of the company at that time was $750,000 and there were $133,000 bonds outstanding. With the election of the new executive $250,000 additional capital stock was issued, providing funds for enlargement of the property. Mr. Insull's intimate connection with Thomas A. Edison during the eleven years from 1881 to 1892 had given him a far-sighted view of the prospects for the central station industry. As personal financial manager for Mr. Edison and one of the executives of the various companies organized by the inventor in the early days Mr. Insull acquired a knowledge which he carried later into the daily operations of the Chicago property. The name and the vision of Edison have always been given full credit in Chicago.

It is interesting to recall that when Mr. Insull resigned in 1892 as the second vice-president of the General Electric Company, which had just been formed as a consolidation of the Edison General Electric Com-

pany and the Thomson-Houston Electric Company, the ELECTRICAL ENGINEER, one of the publications combined later to form the ELECTRICAL WORLD, said (issue of June 1, 1892):

"The Chicago Edison Company is an organization of wealthy Chicago merchants and bankers, and bids fair soon to be the largest local lighting company in the world. . . . It is about to build a huge new station whose ultimate capacity, it is said, is likely to be 50,000 or 60,000 hp."

In after years Mr. Insull referred to his acceptance of the Chicago position as "the best opportunity that I knew of in the United States to develop the business of the production and distribution of electrical energy."

At the time of organization, as well as in the ensuing years, the company had leading bankers and business men of the city among its directors and heavy stockholders. Robert T. Lincoln, whose name is known internationally, was a member of the 1887 board of directors, and he still serves in that capacity in the present organization. The increase in the investment and the totals of securities which have come with the progress of a quarter of a century mean, of course, a far wider distribution of the securities than was possible in the first years of development. At this date the ownership of the stock is divided among 2972 stockholders, of whom 1191 are women. Employees of a total of 546 own stock and, in addition, 1640 are in process of becoming stockholders through the operation of the savings investment fund which is a notable feature of the welfare work inaugurated by the company.

From the beginning the development of the property was rapid. Not only was the discriminating prediction of the ELECTRICAL ENGINEER borne out as to the volume of lighting business, but it has been made true in the upbuilding of the far greater power loads which were then unforeseen. The growth of the Chicago system has been directed consistently towards the concentration of production and distribution, larger and larger totals in generation and output and complete monopoly, but not without public regulation.

Some of the earlier items in the history of the company should be given. In 1893 the capital stock was increased to $3,000,000. During the same year $2,250,000 bonds were issued and the Chicago Arc Light & Power Company was absorbed. This company, which in 1892 was larger than the Chicago Edison Company, had built up a competitive business and had acquired various small independent properties. The new corporation formed as a result of the consolidation of the two large properties had the title "Chicago Edison Company."

SOME STATISTICS SHOWING THE MAGNITUDE OF THE COMMONWEALTH EDISON COMPANY

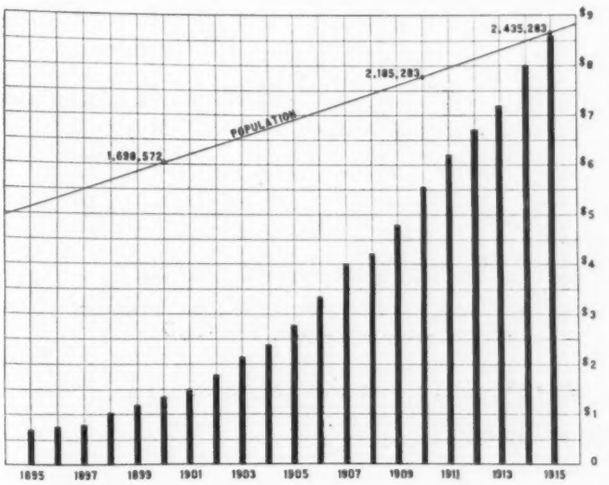
Total number of employees (April 15, 1916)	4,648
Number of electric vehicles (May 1, 1916)	133
Total number of regular customers (March 31, 1916)	286,202
Miles of electric railways supplied with energy	1,500
Kilowatt-hours sold to electric railways (year 1915)	670,902,847
Tons of coal consumed in 1915	1,586,194
Taxes paid in 1915 (including municipal compensation)	$1,582,039
Maximum output in winter of 1915-1916 (Dec. 24, 1915), kw.-hr.	4,550,137
Maximum connected load for 1915 (total as of Dec. 31), kw.	834,056
Area served by Commonwealth Edison Company, square miles	199
Miles of cable system (Jan. 1, 1916)	2,123
Miles of overhead system (Jan. 1, 1916)	7,850
Miles of underground conduits (Jan. 1, 1916)	3,986
Total rating of generating plants (Dec. 31, 1915), kw.	377,150
Total number of generating plants	8
Total number of substations	48
Peak load in 1915 and date thereof (Nov. 29, 1915), kw.	337,900
Load factor (year 1915), per cent	42.5
Average income per kilowatt-hour, cents	1.94

EARNINGS AND OUTPUT OF THE COMMONWEALTH EDISON COMPANY AND ITS PREDECESSORS

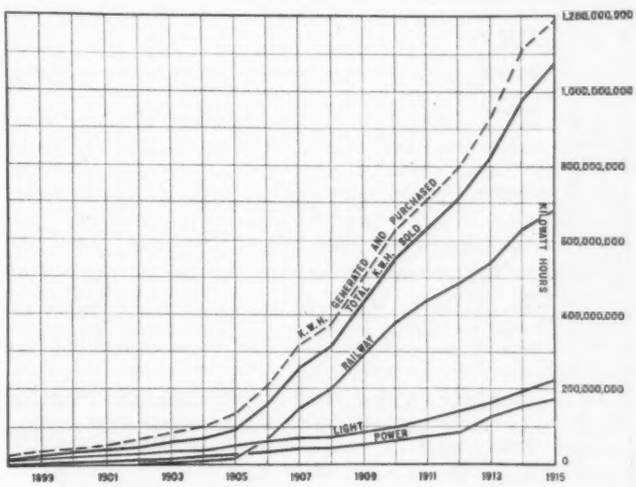
The following table shows the earnings from the sale of electricity and the kilowatt-hours generated and purchased by the Commonwealth Edison Company and by the combined Chicago Edison Company and Commonwealth Electric Company, before those two companies were consolidated to form the Commonwealth Edison Company.

Year Ending Dec. 31	Earnings from Sale of Electricity	Per Cent of Increase Over Previous Year	Kw.-hr. Generated, Incl. Purchased Energy	Per Cent of Increase Over Previous Year
1898	$1,629,899	....	26,084,000	....
1899	1,954,172	19.9	32,755,000	25.6
1900	2,260,812	15.7	39,084,000	19.3
1901	2,608,244	15.4	46,726,000	19.6
1902	3,245,869	24.4	65,656,000	40.5
1903	3,941,435	21.4	84,928,000	29.4
1904	4,443,917	12.7	100,914,000	18.8
1905	5,364,159	20.7	131,198,000	30
1906	6,587,243	22.8	206,250,000	57.2
1907	8,142,646	23.6	313,231,000	51.9
1908	8,748,566	7.4	373,980,000	19.4
1909	10,143,361	15.9	491,487,000	31.4
1910	12,157,646	19.9	626,466,000	27.5
1911	13,902,266	14.3	719,391,000	14.8
1912	15,361,650	10.5	798,677,000	11
1913	16,838,744	9.6	929,247,000	16.3
1914	19,060,197	13.2	1,114,130,000	19.9
1915	20,882,327	9.6	1,198,637,000	7.6
Total gain 1898-1915	$19,252,428	1,181.2	1,172,553,000	4,495.3
Average gain per year 1898-1915	1,132,496	16.3	68,973,000	25.9

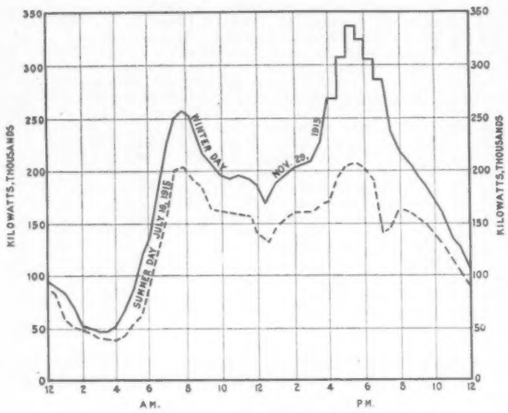
In 1893 Chicago had its famous World's Fair, and this included by far the finest electrical display that had been seen up to that time. The year following that one witnessed the commencement of construction of the Harrison Street plant, which represented a substantial advance in engineering practice. Compared with previous practice, this station meant something like a moderate cost of production, and high expectations were centered upon it. But within eight years the cost then attained was nearly approached by the selling price which subsequent economies and greater volume of



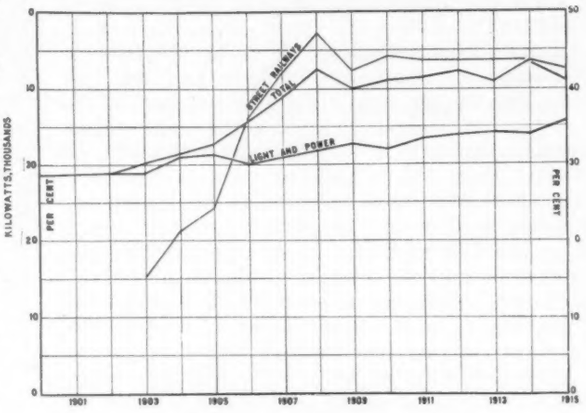
EARNINGS FROM SALE OF ELECTRICITY PER CAPITA



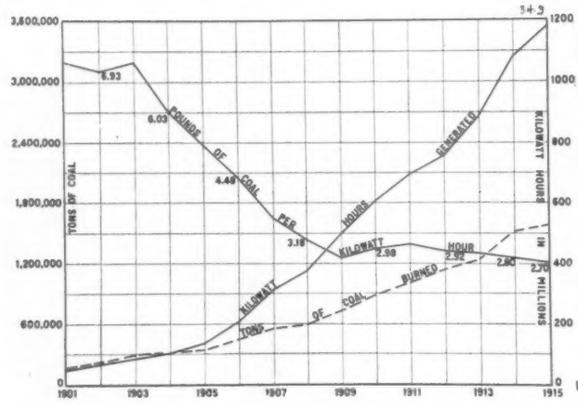
KILOWATT-HOURS PRODUCED AND SOLD, 1898-1915



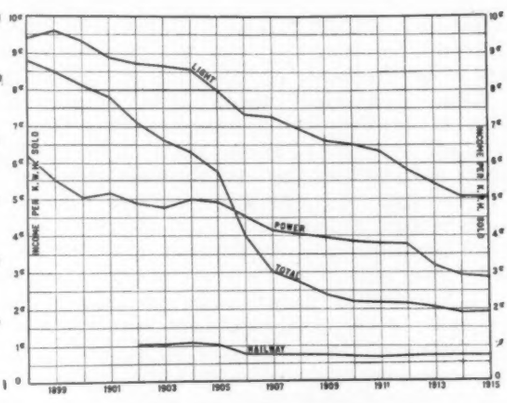
CHARACTERISTIC DAILY TOTAL OUTPUTS



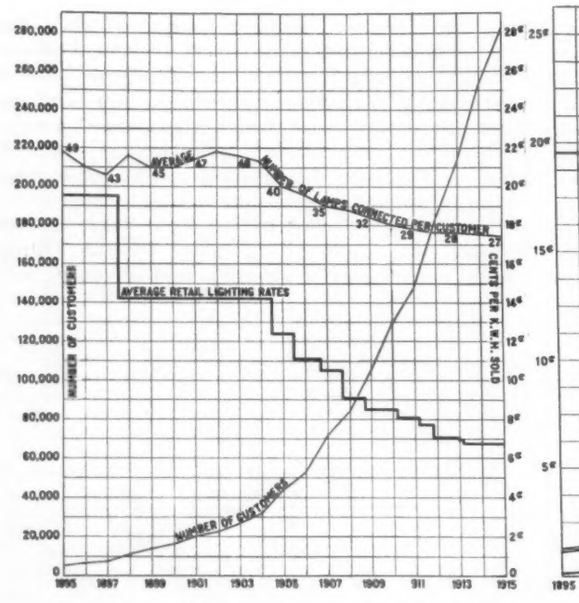
ANNUAL LOAD FACTORS OF SYSTEM


TONS OF COAL
POUNDS OF COAL PER KILOWATT HOUR
KILOWATT HOURS GENERATED IN MILLIONS
TONS OF COAL BURNED PER KILOWATT HOUR

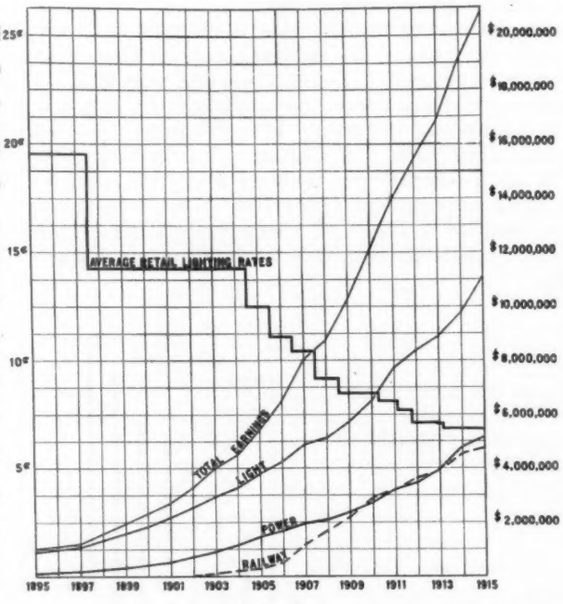
CONSERVATION OF COAL PER UNIT GENERATED



INCOME PER KILOWATT-HOUR SOLD



REDUCTION IN LIGHTING RATES, AVERAGE LAMPS PER CUSTOMER, AND NUMBER OF CUSTOMERS



EARNINGS FROM SALE OF ELECTRICITY AND AVERAGE RETAIL LIGHTING RATES, 1895-1915

Statistical Curves of Production and Sales of Energy by the Commonwealth Edison Company, Chicago

business made possible. Now the station is being abandoned as no longer economical to operate. The total output of the Harrison Street plant during its life was 534,783,000 kw.-hr., which is less than one-half of the total output of the Commonwealth Edison Company for the year 1915.

EARLY STATISTICS

When contrasted with the tremendous totals of the present day the statistics relating to the early operations of the Chicago company become insignificant. In 1892 the average size of the units was about 200 hp.; the output was about 4000 hp. and the gross revenue from sales of electrical energy was $375,000. At that time the company still retained a large merchandising business, but this was dropped as the general operations became of more and more pronounced central station character.

The upbuilding of the Chicago property is interwoven so closely with that of the industry at large and the economic policies of that company are recognized so frequently as those for which the greater aggregations of companies stand that it is not necessary to separate them. Speaking before the Association of Edison Electric Illuminating Companies in 1897 as the president of that organization, Mr. Insull, with the practice of the Chicago company evidently in mind, said: "The use of large generating units in the larger stations for the production of electrical energy, begun but a few years ago, and the necessity of extending the fields of our operations into distant portions of our territory, have forced upon many of us the desirability of employing more economical methods of transmission, with a view to the abandonment of small and expensive stations and the concentration of our production of electricity at the point of greatest ecenomy." These ideas are still fundamental.

The foregoing outline of policies was made in the year when one of the most far-reaching changes, looking to further concentration, was begun in Chicago. The Commonwealth Electric Company, incorporated in 1897, was given a fifty-year franchise in the city of Chicago, and in the following year, when the capital stock was increased from the small amount of the date of formation to $5,000,000, Mr. Insull became the president. The immediate purpose of this step was the acquisition of various properties operating in the outlying sections of the city; but the long term of franchise made the new company the natural medium for placing all of the business under one corporate roof and undoubtedly this general plan for the future was in contemplation. Having practically common officers, directors and management, the parallel development of the two separate corporations with a view to their co-ordination and ultimate combination was assured.

The closeness of the inter-connection between the Chicago Edison Company and the Commonwealth Electric Company was increased as the years passed. The construction of the Fisk Street generating station in 1902 was directed by the Commonwealth Electric Company. In that year the North Shore Electric Company was organized by the same interests to consolidate a number of companies in one of the outlying suburban districts. The North Shore company, however, was never a constituent part of the Chicago properties. It is now controlled by the Public Service Company of Northern Illinois, one of the combinations which is directed by Mr. Insull and his associates.

With the actual merger of the Chicago Edison Company and the Commonwealth Electric Company to form the Commonwealth Edison Company in 1907, the broad principles controlling the business in Chicago were made still more definite. Negotiations for the sale of power to electric railways had been begun on a small scale about the year 1902. The result of this step became revolutionary in the operations, and the necessity for greater generating capacity expanded at a rate beyond experience. The sales of energy to electric railways and the results of greater output on the average cost gave more courage to experiment with lower rates for industrial power contracts, and this had a powerful effect in enlarging the demand for service. The changes during the most important period of years, with the exceedingly rapid increase in the scope of operations, are best shown by the table published on page 1141, showing the gross revenues from the sales of energy and the kilowatt-hour output from 1898 to date.

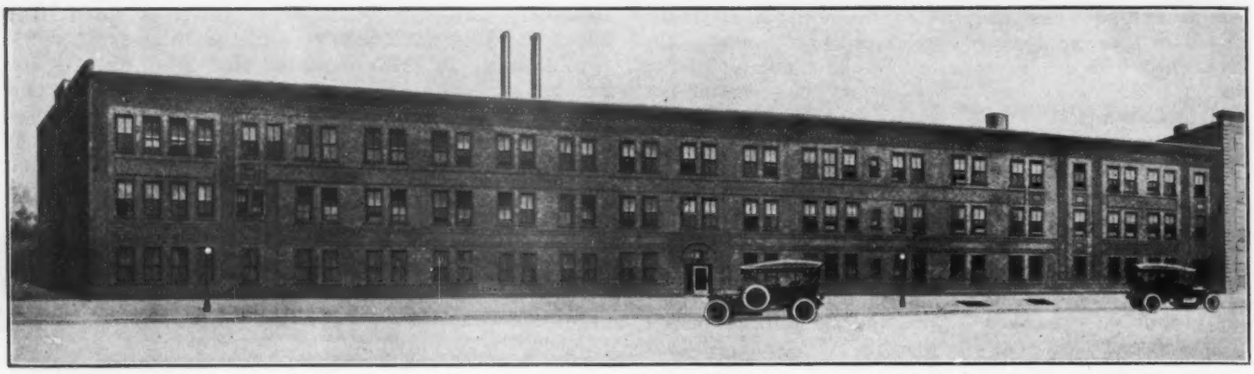
Now and for several years past the Commonwealth Edison Company has been the one accepted source of generation and distribution in Chicago for energy for light and power for general purposes as well as for the operation of the extensive surface and elevated electric railway systems. It has frankly built up its business as a monopoly on economic grounds, seeking and accepting regulation as a public utility. Among engineers on both sides of the Atlantic Ocean its well-known principles of management have long been regarded as of primary importance. Its readiness to experiment, its willingness to "scrap" uneconomical machinery for that which would be economical to operate and its constant striving for large output are world-known policies.

Combined with these more spectacular characteristics are the insistence within the management of the serious burden imposed by the interest charges which are the heaviest items on the cost sheets, the immeasurable importance of the "engineering of selling" as a factor absolutely indispensable to successful results and the need of maintaining service at all hazards and of getting costs so low that power users cannot afford not to be customers. With these policies are woven strength of organization.

"MASSING" AND "WHOLESALING"

The "massing of production" and the "wholesaling of energy" are phrases which are very familiar to students of Chicago conditions to-day. Yet the foundation principles that have guided the management were much the same when it contracted for the first large steam turbine constructed in the world, which was installed in the Fisk Street station. Then, as now, the company believed in a "junk pile." It did not hesitate to discard the early units of this type which became relatively small when the progress of the art made larger units available.

A leading factor in the successful management of the property is indicated by the brief reference made in the foregoing to the serious burden of interest charges which the heavy costs of construction inevitably impose upon a public utility. The responsibility which the company assumes in this respect is impressed upon the junior as well as the senior officials. In the young years of the industry, when capital flowed less freely than it does in these times of long records of increases in earnings, the Chicago company had the name of being a good borrower. One reason for this was its ability in selling bonds in the market which offered the best price. If a block of bonds did not bring a good offer in the Chicago market the securities were offered in New York, and if the price obtainable there was not satisfactory the bonds were offered in London. The Chicago company had a sure market for its securities in each of those centers, and that helps to explain why it has been so successful in obtaining capital to build up a property with an aggregate of $90,000,000 capital stock and bonds outstanding and correspondingly large annual revenues and output of energy.



THE UNDERWRITERS' LABORATORIES, CHICAGO, "THE BEST EXAMPLE IN AMERICA OF ABSOLUTELY FIREPROOF CONSTRUCTION"

The Underwriters' Laboratories and the Industry

W. H. Merrill, President of the Underwriters' Organization, Acknowledges the Support of Central Stations and Discusses the Development of Closer Co-operation

Mr. Merrill discusses the functions of the Underwriters' Laboratories in the electrical industry. The contact with the interests of central stations is made largely through the manufacturing branch of the business but Mr. Merrill believes that the direct co-operation can be strengthened with mutual advantage. The interview has a special interest at this time because of the fact that the present extensive establishment, which has grown from a very small original office, is located in the N. E. L. A. convention city.

FIFTH IN A SERIES OF "TALKS IN THE INDUSTRY"

By Frederic Nicholas

"So far as possible it is the practice of the Underwriters' Laboratories," said Mr. Merrill, "to make its work constructive. We are not trying to fill the place of the engineer who designs electrical supplies, but it is our custom, where it seems practicable, to advise the manufacturer submitting a product how safeguards proved to be necessary can be secured economically.

"The problem before the insurance interests, as it relates to the electrical industry, has been that of maintaining a reasonable measure of safety in a fair and economical way. It has been fully understood all the time that any system or institution that endeavored to impose conditions which were unnecessarily burdensome upon any branch of the industry would certainly fail to obtain the desired measure of safety. I believe that underwriters appreciate quite as keenly as does anybody else the importance of protecting from all unnecessary expense a service which is so essential to the public welfare as electricity. They are not less public-spirited than other people. Since electricity is so much more likely to be properly safeguarded than some other forms of energy, they have tried to avoid advocating restrictions that would unnecessarily discourage electrical development.

"From the beginning of the movement to secure a reasonable measure of safety the central station people have had every opportunity to have their views prevail in changes in the National Electrical Code which the growth of the industry has appeared to necessitate.

"A compliance with the rules of the National Electrical Code in all electrical work, and the use of only those materials and appliances which are listed as standard by the Underwriters' Laboratories is the general practice of inspection organizations throughout the country. In this way the electrical fire hazard has been safeguarded more thoroughly and more economically than has any other fire hazard that I know about. There can be no question that this has been a very real contribution in electrical progress, for no form of energy whose use was attended with any considerable hazard could become popular.

"An editorial along these lines that was published in the Electrical World nearly three years ago impressed me as stating the case unusually well. The bad effect of defective sub-standard electric wiring was strongly emphasized in the very correct assertion that such work tended to destroy the confidence of the public in electric service, and to create an uneasiness as to the safety of electricity which was bound to hurt the central station and the electrical business in general."

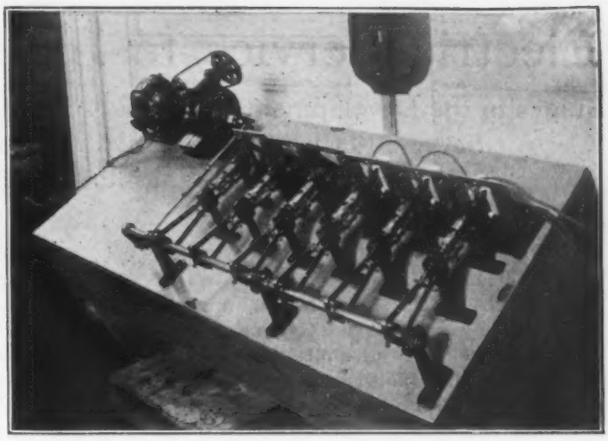
Mr. Merrill said that the Underwriters' Laboratories has never been misled by the fallacy that any single individual or institution could be the one possible source of correct opinions in a given field. "Engineers and manufacturers and central station men and inspection organizations may each have opinions of their own," he added. "From these there is to be had a conclusion that is correct; this conclusion it is our task to discover and apply. In this work we have sought to utilize every resource within our reach for increasing the efficiency of our activities and helping to make them economical. One of the first things we did was to set about finding means whereby the industries which we serve might profit directly from the wise counsel and good judgment of men having extensive experience in the fields where the devices and materials that come before us are to be used. It was our belief that the men having this experience were the best qualified to form correct conclusions from the data obtained in laboratory tests. This thought led to the formation of the Underwriters' Laboratories Councils, of which there are now two, the Fire Council and the Casualty Council. These councils are made up of prominent experts in various parts of the country, representing various interests and including representatives of the federal government. To the first of these the questions of fire hazard are referred; the other is asked to pass upon the recommendations of our engineers concerning the casualty features of products submitted to us. The service which our council members are providing so un-

selfishly through the laboratories is unquestionably one which is of great value to the electrical industry and the public; I doubt if it could be provided through any other channel.

"Of equal interest are the Laboratories' Industry Conferences and our close co-operation with the Associated Manufacturers of Electrical Supplies. The oldest of the Industry Conferences is that on rubber-covered wire, composed of prominent representatives of the wire manufacturers and men from the executive and engineering staffs of the Underwriters' Laboratories. Similarly constituted conferences serve other branches of the electrical supply manufacturing business. The various sections of the Associated Manufacturers of Electrical Supplies have committees to work with us. These industry conferences and the committees mentioned provide ample and efficient means for taking care of matters that concern inspection organizations and the manufacturers. They act with promptness and without duplication of effort or lost motion, thus relieving the industry of the expense which otherwise would be unavoidable.

"One of the ways in which the Laboratories reaches the central stations directly is through the fact that it is represented on the wiring committee of the National Electric Light Association. We are glad to have a member of our staff attend the sessions of this committee, and help in any way. It seems to me that this committee could profit greatly by the free use of the Laboratories' Industry Conferences and the manufacturers' committees which I have mentioned. It would seem that questions relating to existing standardization of electrical supplies could be handled much more economically in this way than through independent effort on the part of the wiring committee."

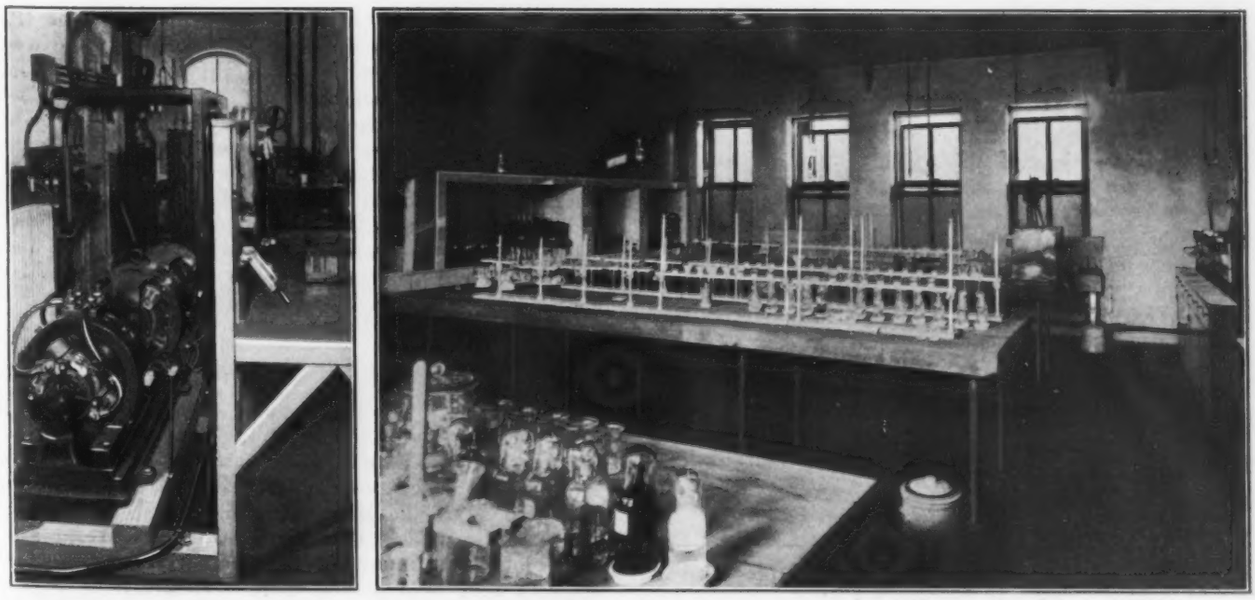
Mr. Merrill spoke of the methods followed by the Laboratories. After a conclusion has been reached certifying a sample article as standard, the Laboratories has to provide means for keeping supplied with comprehensive information concerning the quality of the factory output of the commodity, and its behavior under conditions of actual use. "The inspection and rating of insurance risks makes it necessary for underwriters to maintain offices equipped with staffs of competent engineers and inspectors throughout the United States and Canada," Mr. Merrill added. "Through agencies and branch offices operated in connection with these, a large part of our factory inspection and labeling of standard goods, and other follow-up work is done. I cannot see how work of this sort could be carried on under any other system, except perhaps at a cost that would be a heavy burden on the industry served or in some other way a severe drain on funds collected. As the Laboratories operates this service the cost of it need not usually appear at all in the selling prices of goods."



MACHINE FOR MAKING LIFE TESTS OF PUSH-SWITCHES

Mr. Merrill asserted that while the work of the Underwriters' Laboratories does not touch the central stations so immediately as it does some other branches of the electrical industry, the advantages afforded to that part of the business are none the less real. The central station interests are not separated from the interests of the rest of the electrical business. All are bound to profit when one is benefited.

"There has always been a rather gratifying measure of support from the central station field," he said. "This co-operation is probably of greater importance now than at any time in the past, due to the fact that the use of electricity is being extended into so many small towns and other places which are not favored with electrical inspection. There is always the liability that these places will be victimized by the incompetent wireman and the dispenser of sub-standard, hazardous appliances and materials. In places of this sort, the local central station can do its customers and the industry a good turn by undertaking on its own behalf to make suitable inspection of all installations to which its lines are connected."



A MOTOR-GENERATOR SET IN THE ELECTRICAL LABORATORY AND THE CHEMICAL LABORATORY WHERE WIRE IS TESTED

Electric Service to Interconnected Illinois Towns

Stages in the Development of Illinois Properties of Middle West Utilities Company Which Serve 204 Cities and Hamlets—Economies Effected by Operation of Few Generating Stations and by Unit Management

ACCORDING to census data of 1910, around 70 per cent of the one hundred million people of the United States live in rural districts and in towns and villages of less than 25,000 inhabitants. The furnishing of electric service to groups of these small communities through adequate generation, transmission and distribution facilities has been an important recent development of the central station industry. As a conspicuous example of extensive work in this direction stands the activity of the Middle West Utilities Company, which operates comparatively small utility properties built and interconnected where conditions have permitted the increased efficiency of operation and the added reliability of service resulting therefrom. In the four years of its existence this company has purchased and now operates 355 utility concerns in fourteen states, and showed a gross business for its last fiscal year of $8,000,000. Its properties supply electric, gas, water and ice service to 160,400 patrons and electric service alone to 106,930 customers. The keynote of the entire movement has been conservation of capital, conservation of the country's natural resources and conservation of human effort in the furnishing of electric service to all who can use it.

SUBSIDIARIES OF THE MIDDLE WEST UTILITIES COMPANY SERVING ILLINOIS TOWNS

Particularly in the State of Illinois, where the results of the company's activities have been most marked, this conservation program has been carried most nearly to its completion. Through its three Illinois subsidiaries, the Central Illinois Public Service Company, the Illinois Northern Utilities Company and the Central Illinois Utilities Company, the Middle West Utilities Company is now supplying electric service in 204 cities, towns and hamlets. Of this number 196, or 98 per cent, are reached by the company's transmission lines and may be classed as interconnected towns, although all of these are not connected to a single network. From these Illinois cities the Middle West Utilities Company is receiving 40 per cent of its gross annual revenue.

The section of the country in which these properties lie lends itself admirably to the successful operation of such a system, since the variety of its industries and the different habits of its people assure a diversified demand for electricity. The industries demanding power vary from the elevator and the creamery to the coal mine and the silica producer. The habits of the people differ, since some live in towns of eleven inhabitants and some in towns of 17,000; some are coal miners who quit work at 4 p. m., while others operate drainage systems twenty-four hours a day. It is important that the peaks of the great power users, such as the mines, come off the lighting peak, and that contracts with the drainage districts are written with off-peak clauses. Just how the load divides itself may be judged from the fact that for a typical month the revenue for one Illinois subsidiary was as follows: Residential and commercial lighting and small-motor business, 63 per cent; large power business, 25 per cent, and street lighting, 12 per cent. In some subsidiaries the percentage of revenue from lighting is even greater than that given here.

The largest subsidiary—the Central Illinois Public Service Company—serves 137 towns, varying in population from eleven to 11,000. The plants of the Illinois Northern Utilities Company in the north and west parts of the State serve fifty-eight of the important population centers, ranging in size from fifteen to 17,500 inhabitants. The Central Illinois Utilities Company serves no large cities. Of its twenty-seven towns the largest is Paxton with a population of 2912. The smallest is Del Rey with a population of twenty-three. All of these towns lie in the black land of the Illinois corn belt. In all these wealthy territories, which were formerly served by 101 isolated power plants, the cities are now mostly united by the 1388 miles of transmission line operated by the three subsidiary companies.

TYPES OF PLANTS PURCHASED IN ILLINOIS

Of the plants purchased by the company about 17 per cent formerly had been giving direct-current service and 26 per cent had been giving 133-cycle service. To carry the program of conservation to a point where the customers could share with the company the economies effected, these odd-cycle and direct-current systems along with many others which were odd in some respect, were rebuilt and were standardized. Sixty-

MAIN STREETS OF GENOA AND AMBOY, ILL., SHOWING ORNAMENTAL LIGHTING SYSTEMS SERVED FROM UNDERGROUND CIRCUITS

cycle 110/220-volt alternating-current service has been made universal. In rebuilding the distribution system much of the existing equipment, which at first sight appeared useless, was found of value. Many of the 133-cycle customers' meters were of a type which had been provided with taps, to which leads could be connected for 60-cycle service. Much of the material in distribution lines was also used in the reconstruction. The wire in most cases, especially in the direct-current systems, was of considerable value as copper. The 133-cycle transformers were all taken down and tested. Those which showed small losses were put up again and used on the 60-cycle circuits. Every possible method was employed to put to some use the material contained in the purchased plants. Poles, crossarms and light line hardware were about the only things which had depreciated to no value and which, in progress of standardization, had to be replaced.

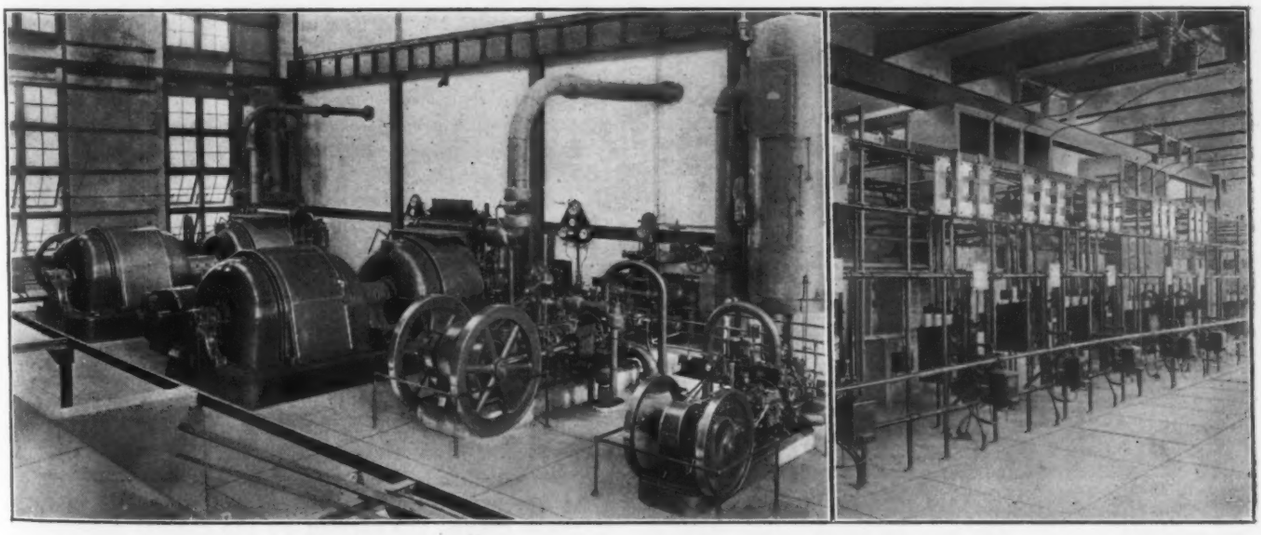
A glimpse at the property of the Central Illinois Utilities Company, as a man closely associated with its growth saw it at the close of 1913, is both interesting and instructive, for through his eyes problems in the upbuilding of such a system may be seen. In a communication written at that time he said:

"The first constituent properties of the Central Illinois Utilities Company were taken over about Oct. 1, 1912. These consisted of eleven towns operated from five power houses and under five individual managements. On the formation of our company, headquarters were established at Paxton, where the company had franchises for electric service, but had no power plant. Work was at once begun to make such temporary repairs as were urgently necessary to enable the company to provide even fairly satisfactory service from the five old stations to carry these along until such time as interconnecting transmission lines and a reliable power house could be constructed. The work of creating these transmission lines and rebuilding the local distributing systems was immediately started and energetically pursued in order to eliminate the old uneconomical power houses.

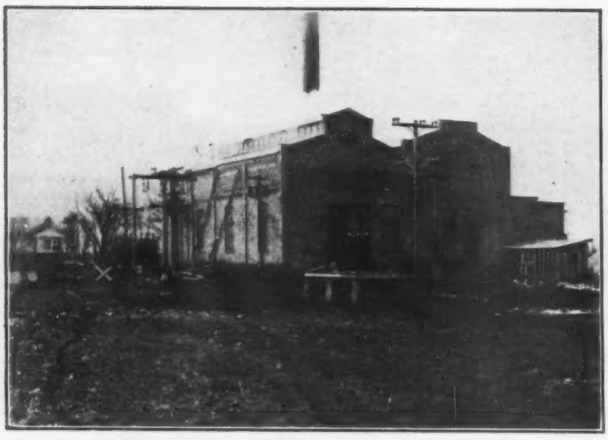
"During the year a total of 90.25 miles of 33,000-volt transmission line were built, 51.25 miles of which consisted of No. 2 copper wire on 35-ft. poles and 39 miles of No. 4 copper wire on 30-ft. poles. All of this line was built on railroad right of way with the exception of 17 miles, which was built on the public highways. In addition to this, we have 13.75 miles of 16,500-volt line and 16 miles of 6600-volt line, all of which has been overhauled and defective poles, crossarms, insulators, guys, etc., replaced.

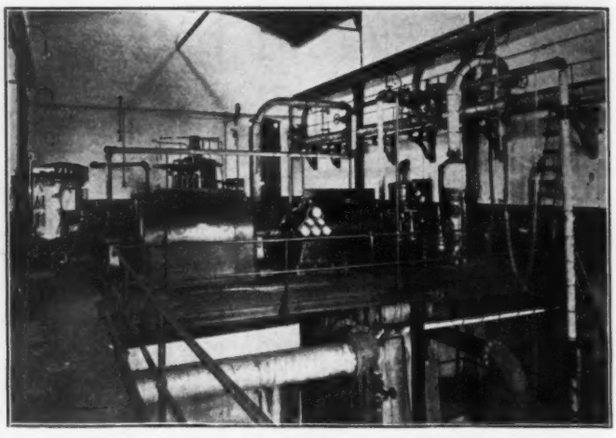
"We have a total of approximately 100 miles of street or pole lines in our distributing system. Of this, already 85 miles has been rebuilt. We still have the street-lighting system to rebuild in six villages, when they shall have entered into new street-lighting contracts as the old ones expire. The following details indicate the work done in two of the more interesting situations:

"Fairbury.—This was a single-phase, 133-cycle plant. One boiler was entirely disabled. One boiler did not have sufficient draft, and was inclined to send the gases out through the fire door instead of through the stack. This boiler had been damaged in erection, did not have a straight tube in it, and was leaking so badly that there was a deposit of about five tons of solid salt between the tubes from the leaks and the sulphur water used. It had been fired in this condition until it was absolutely beyond use. The cheapest and quickest thing for us to do was to put in a new boiler, which



TURBINE ROOM OF THE POWER STATION AT KINCAID, ILL. AT THE RIGHT, HIGH-TENSION ROOM SHOWING BUSES AND SWITCHING ARRANGEMENTS





EXTERIOR AND INTERIOR VIEWS OF THE NEW POWER STATION AT WATSEKA

we did. The steam-piping had to be gone over. One engine could not be operated for lack of foundation. The other engine had to be overhauled. The building was originally an old barn. The wiring between generators and switchboard was without insulation or insulators, and during rain or melting snow the building would catch fire. We rewired the building, installed a temporary switchboard, furnished a new exciter, and in this way hoped to hold together until the Interstate Public Service Company of Indiana could furnish us power. Since the town had been served with 133-cycle energy and our new service was 60 cycles, we met many difficulties and much expense in serving the public.

"Chatsworth.—The Chatsworth plant was a single-phase plant not in much better condition than the Fairbury plant. The boilers were leaking and in a dangerous condition. The boiler tubes were in such bad condition before we received the property that the old owners, instead of buying new tubes, had taken small pieces of other tubes and driven them in with a sledge hammer, and by so doing had lengthened the old tubes sufficiently to hold them and had managed to create steam enough to turn the engines, although it took three 100-hp. boilers to operate a load of approximately 100 hp. We retubed the boilers, overhauled the piping, and rebuilt the generator to make a 60-cycle machine of it. With these repairs we were able to keep the plant in service the necessary length of time."

GROWTH OF THE SYSTEM LOAD SHOWN BY KILOWATT-HOURS SOLD PER MONTH

Month and Year	I. N. U. Co.	C. I. U. Co.	C. I. P. S. Co.	Total
June, 1913	404,869	76,405	1,257,678	1,738,952
July, 1913	523,287	88,857	1,407,757	2,019,900
August, 1913	629,519	92,309	1,400,066	2,121,894
September, 1913	737,208	105,911	1,345,614	2,188,733
October, 1913	685,682	132,697	1,412,940	2,229,319
November, 1913	722,676	139,357	1,338,372	2,200,405
December, 1913	818,015	158,922	1,498,957	2,475,894
January 1914	884,460	148,663	2,399,150	3,432,273
February, 1914	826,620	125,254	1,940,893	2,892,767
March, 1914	748,285	109,880	2,556,661	3,414,826
April, 1914	755,938	105,974	1,935,728	2,797,640
May, 1914	753,392	100,750	2,015,378	2,869,520
June 1914	724,692	103,921	1,957,096	2,785,709
July, 1914	737,535	117,639	2,188,133	3,043,307
August, 1914	832,715	120,646	2,234,205	3,187,566
September, 1914	938,043	131,119	2,224,054	3,293,216
October, 1914	845,691	143,941	2,511,177	3,500,809
November, 1914	927,224	149,577	2,629,439	3,706,240
December, 1914	1,059,987	168,661	3,019,320	4,247,868
January, 1915	1,005,411	163,247	2,929,164	4,097,822
February, 1915	843,545	155,064	2,718,779	3,717,408
March, 1915	844,680	134,234	2,729,851	3,708,765
April, 1915	761,042	126,152	2,375,425	3,262,619
May, 1915	729,616	125,779	2,478,290	3,333,685
June, 1915	678,650	119,925	2,569,483	3,368,058
July, 1915	676,638	126,957	2,912,382	3,715,977
August, 1915	769,941	146,660	2,889,855	3,806,456
September 1915	781,217	166,350	2,927,882	3,875,449
October, 1915	890,055	176,558	2,962,010	3,028,623
November, 1915	964,516	188,921	3,108,236	4,261,673
December, 1915	1,036,304	198,428	3,577,764	4,812,496
January, 1916	1,065,996	195,806	3,700,766	4,962,568
February, 1916	1,060,887	179,627	3,519,164	4,759,678
March, 1916	975,963	159,926	3,313,618	4,449,507

The conditions as they are here depicted did not continue long. A consulting engineer was employed to locate an ideal power-house site. He proposed a location at the junction of two streams near Watseka because it was a site at which sufficient water was available and which was near the geographic center of the system. Further investigation showed, however, that the expense of constructing a railroad siding to that point would prohibit its use, and a site about 0.25 mile upstream on Sugar Creek was selected. At this point the company's 2000-kw. steam plant stands to-day. This 2000-kw. station now carries the entire system load except in emergencies or in the winter months when the steam-heating load at Paxton makes it economical to operate the 440-kw. stand-by plant there.

The history of the growth of the Central Illinois Public Service Company and the Illinois Northern Utilities Company is much like that of the Central Illinois Utilities Company except that operations of the former have been vastly more extensive, there being times when the company acquired options on as many as thirty plants in one week. It may, however, be of interest to note the general arrangement of generating stations on the lines of the Central Illinois Public Service Company, where the interconnecting system is most complete. With the exception of those properties which the company has in the extreme southern part of the State, its properties are practically all tied together. At almost the exact center of that broad expanse of lines across the central part of the State lies the newly created model city of Kincaid—the site of a thoroughly modern 6000-kw. steam plant. Situated at the very mouth of a coal mine and on the bank of a good-sized stream, this station takes advantage of conditions that make it possible to produce energy economically.

The western portion of the system is served by a 900-kw. plant at Beardstown and by a connection at Hull, Ill., with the lines of the Mississippi River Power Company of Keokuk, Iowa. The Beardstown plant is located on a river and on a railroad within reach of a reasonably cheap fuel supply. The 1850-kw. station for the eastern portion of the system is located at Mattoon, which in itself is a load center on account of its comparatively large population and the steam-heating load which exists there in the winter. The company's two main plants at Anna and Carbondale in the southern part of the State have a rating of 480 kw. and 450 kw. respectively. These stations are located in one of the largest coal fields in the United States.

As a general rule the loads of the properties in each of these groups are carried by the central generating station. Smaller outlying plants in many of the towns are maintained in running condition so that they may

be operated in emergencies. In some of the smaller towns, where the company has acquired steam-heating franchises, the smaller plants are operated in the winter, carrying as much of the system load as necessary to produce the required amount of exhaust steam for heating.

DATA ON GROWTH OF ILLINOIS PROPERTIES

The miles of transmission line erected each year is tangible proof of the rapid growth of all three subsidiary Illinois companies. This data is given in the accompanying table.

MILES OF TRANSMISSION LINES PURCHASED, ERECTED AND NOW UNDER CONSTRUCTION

	1912	1913	1914	1915	1916
Central Illinois Public Service Co...	50	425	563	712	822
Central Illinois Utilities Co.....	30	120	145	155	155
Illinois Northern Utilities Co.....	50	260	320	334	411
Total miles of line.....	130	805	1,028	1,201	1,388

A small percentage of these lines was purchased from other companies. Practically all of the lines are of the type illustrated herewith and described in detail in the ELECTRICAL WORLD May 31, 1913. Of the company's general substation practice it may be said that all stations of 150-kw. size or smaller are of the outdoor type unless it so happens that an existing building acquired by the company in the town to be served can be used as a substation at less cost.

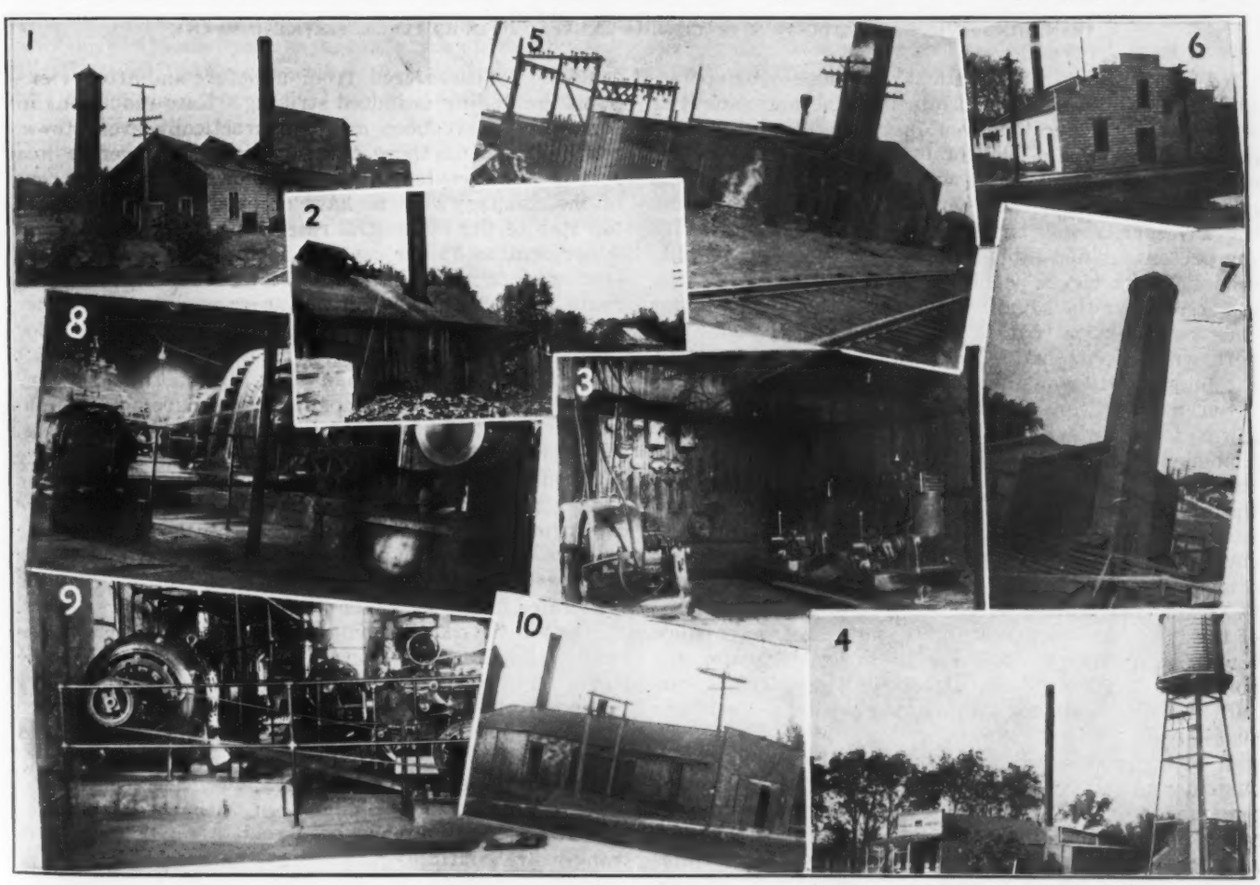
Further evidence of the growth of the system may be seen in the record of kilowatt-hours sold per month as given in an accompanying table. While this total rises and falls in the usual manner as the seasons rotate, the business for each year has shown an increase over each preceding year, and each month an increase over the same month of the year before.

Characteristic load curves for two of the larger stations of two subsidiary companies are shown in the following pages. A typical winter load curve and a typical summer load curve of the Kincaid station of the Central Illinois Public Service Company, show a maximum peak occurring just before mid-day, falling off abruptly at 4 p. m. when the miners quit work, and rising to the second and auxiliary peak at 8 p. m. It is evident that the characteristics of this load are largely influenced by the operation of the mines. The winter curve shows the load on Feb. 9, 1916. On this day the output was 38,537 kw.-hr., the peak was 3900 kw. and the load factor was 41.2 per cent. The summer curve shows the load on July 21, 1915. On this day the output was 31,393 kw.-hr., the peak was 3400 kw. and the load factor was 38.5 per cent.

Typical curves for summer and winter conditions on the Watseka plant of the Central Illinois Utilities Company (see page 1151) have different characteristics. The peak in both seasons occurs during the lighting hours of the evening. The summer curve represents the conditions on Aug. 21, 1915, when the maximum was 950 kw. The output for the month of August, 1915, was 257,730 kw.-hr. The winter curve is for Dec. 18, 1915, when the maximum was 1150 kw. and the station output was 357,600 kw.-hr. for the month of December. Records of daily output may be closely approximated in both cases by dividing the monthly output by 31.

MUTUAL ADVANTAGES TO COMMUNITIES AND UTILITY

The building of transmission lines as a step in the program of system development has effected advantages

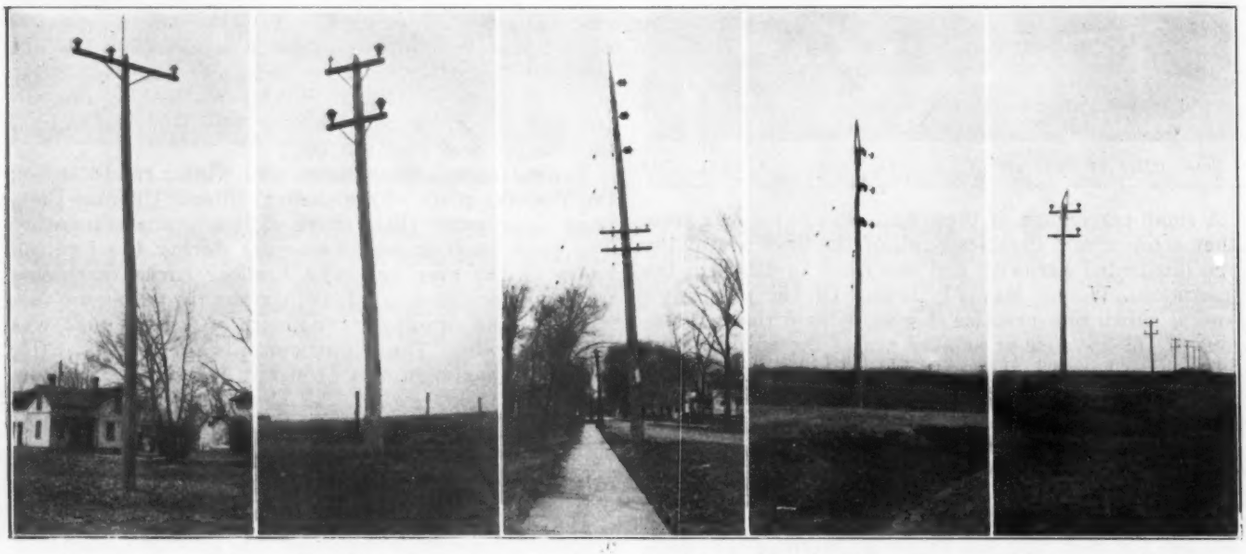


TYPICAL POWER STATIONS FORMERLY OPERATED IN SMALL ILLINOIS TOWNS AND PURCHASED BY MIDDLE WEST UTILITIES CO.

1—Power station at Fairbury. 2—Plant at Kansas. 3—Interior of Gibson city station. 4—Power station at Alexis. 5—Power station at Mendota. 6—Power Station at Genesco. 7—Gibson city station. 8—Oregon power station. 9—Typical crowded engine room. 10—Power station at Alpha.

that may be classified under two heads: (1) advantages to the communities and their inhabitants, and (2) advantages to the utility company. The advantages to the communities are, better service, better rates and enhanced appearance of the towns.

The unified management and operation has brought universal unlimited twenty-four-hour service, whereas among towns now served by this company's lines there formerly were eighty-one villages which were either too small or too poor to support any kind of a lighting system. Then there were sixty-three towns in which the isolated plant owners could not make any money by operating in the daytime. The plants in these municipalities were therefore operated from dusk to midnight or from dusk to dawn. Out of the total of 204 Illinois towns the company now serves, there were only sixty-eight which boasted twenty-four-hour service and in some of these the day service was an unprofitable proposition. With the present unified inter-connected service Magnet, Ill., a hamlet with eleven people and two electric service customers, enjoys the same reliable and continuous twenty-four hour service that is given in Mattoon and Freeport with 12,000 and 18,000 inhabitants respectively, the biggest cities on the company's lines.



Class A Construction Class B Construction Angle Construction Transposition at Turn Line Transposition

TRANSMISSION LINE CONSTRUCTION PRACTICE OF CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

Service was not available to everyone even in the towns formerly served by small plants. The distribution systems covered only portions of the towns and funds were not always available for extensions. At the present time, however, the distribution systems of the inter-connected company have been extended to cover 33 per cent more territory than those of the old companies. This growth has been brought about partly by the increased demand for service and partly by virtue of the fact that new street lighting contracts have called for lighting entire villages. In the latter cases the pole lines that carry the street lighting circuits can, and in most cases do, also carry circuits to residence customers.

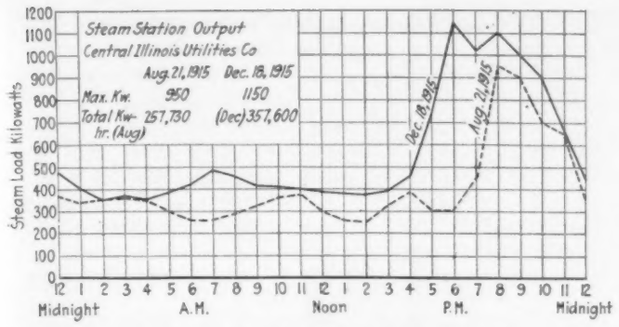
It was formerly well nigh impossible for a small town customer to secure service in large quantities since the appearance of a 50-kw. load in most towns would have necessitated rebuilding the central station. Now the addition of a big customer in a small town necessitates merely the setting of a new transformer bank and perhaps stringing a little wire. Manufacturing plants—the industries small towns most need—can now be served as well in Alpha, Ill., as in Chicago.

An additional benefit has been made possible by the standardization of service. Everyone uses 110 or 220-volt 60-cycle alternating current energy, and in consequence lamps, appliances and motors can be purchased at low prices. The price charged for lamps by the central station in a small town before being taken over by the Middle West Utilities Company in 1916 was 45 cents. The inhabitants of this town now buy lamps that give just as much light and better service for 22 cents each.

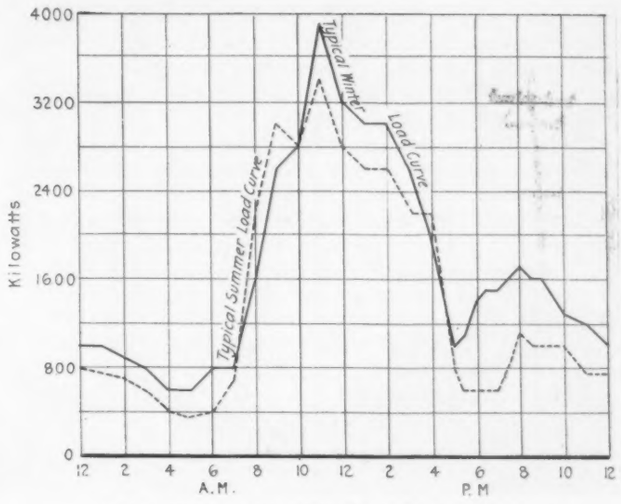
When the subject of rates in the towns served by the company is considered from a before-and-after viewpoint the finding is indeed striking. Rate reductions in some form have been made in practically every town. For instance, if those towns which never before had service are excepted, it may be shown that 48 per cent of the company's towns have enjoyed reductions in the top step of the residential rates ranging in extent from 4 per cent to 55 per cent. The top rate for residence customers in most of the small towns is now between 15 cents and 13 cents, whereas 30 cents was the former price in at least one place, while 20-cent rates prevailed in many places. Lower power rates have gone into effect everywhere. Now a manufacturer in the territory served by the Illinois companies can secure not only unlimited quantities of good service in the small towns, but at rates just as low as he would pay in the large adjacent cities. The industries of the state need no longer group themselves along the streams to secure cheap power. The fact that the Central Illinois Public Service Company supplies energy for twenty coal mines and twelve large drainage districts is indicative of the way rates have been taken advantage of by power users.

The most striking example of what can be done in the way of lowering rates on this sort of a system is to be found in the cooking and heating rate. The progressive housewife of the smallest hamlet can now get service for cooking electrically at a 2.5 cent net rate. In all towns, many of which are so small that they could never hope for gas service, the exploitation of electric cooking is being aggressively undertaken with the result that 400 ranges have already been sold in small towns, and ranges are continuing to sell at the rate of about five a day.

Besides providing better service at lower rates the company is enhancing the appearance of the towns it serves. It is making them more pleasant home towns


Steam Station Output
Central Illinois Utilities Co
Aug. 21, 1915 Dec. 18, 1915
Max. Kw. 950 1150
Total Kw-hr. (Aug) 257,730 (Dec) 357,600
Steam Load Kilowatts
Midnight A.M. Noon P.M. Midnight

LOAD CURVES FOR WATSEKA STATION OF CENTRAL ILLINOIS UTILITIES COMPANY



LOAD CURVES FOR KINCAID (ILL.) STATION

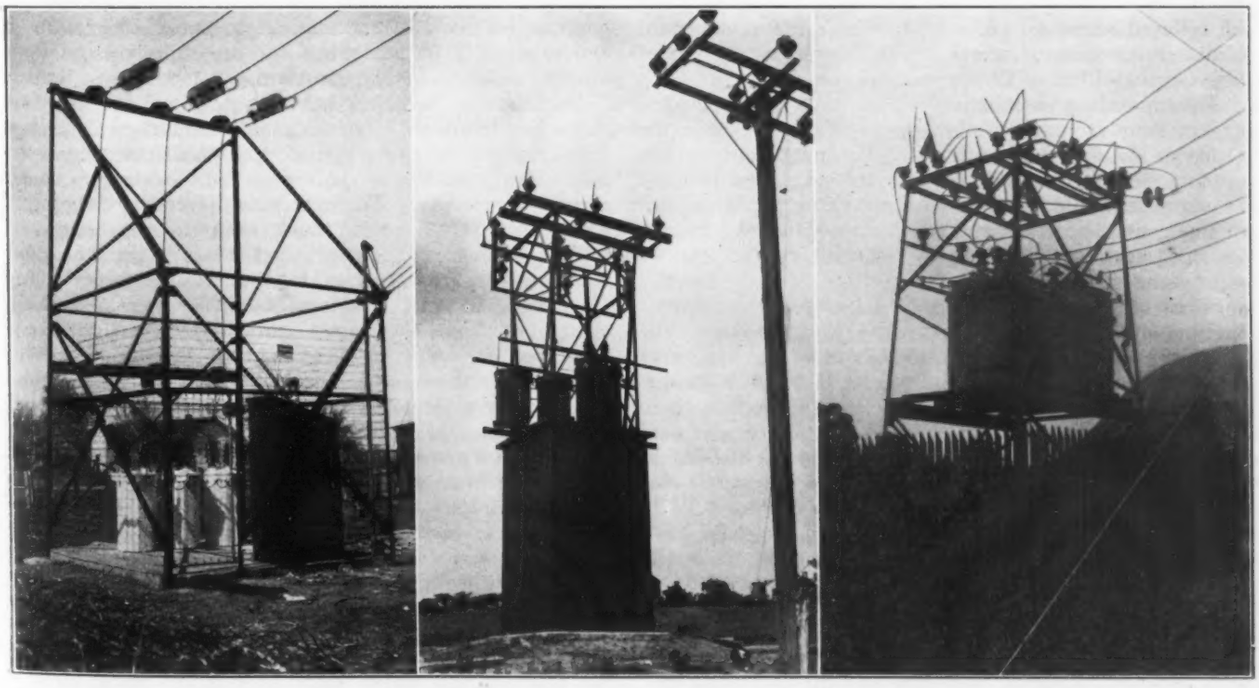
and more profitable industrial centers. Wherever ornamental white-way systems have been installed the wiring of the business section has been placed underground. Further, it is the policy of the company to place all of its lines in the alleys when rebuilding distribution circuits. The illustrations shown indicate the type of construction for distribution systems.

Economies of Unit Operation and Management

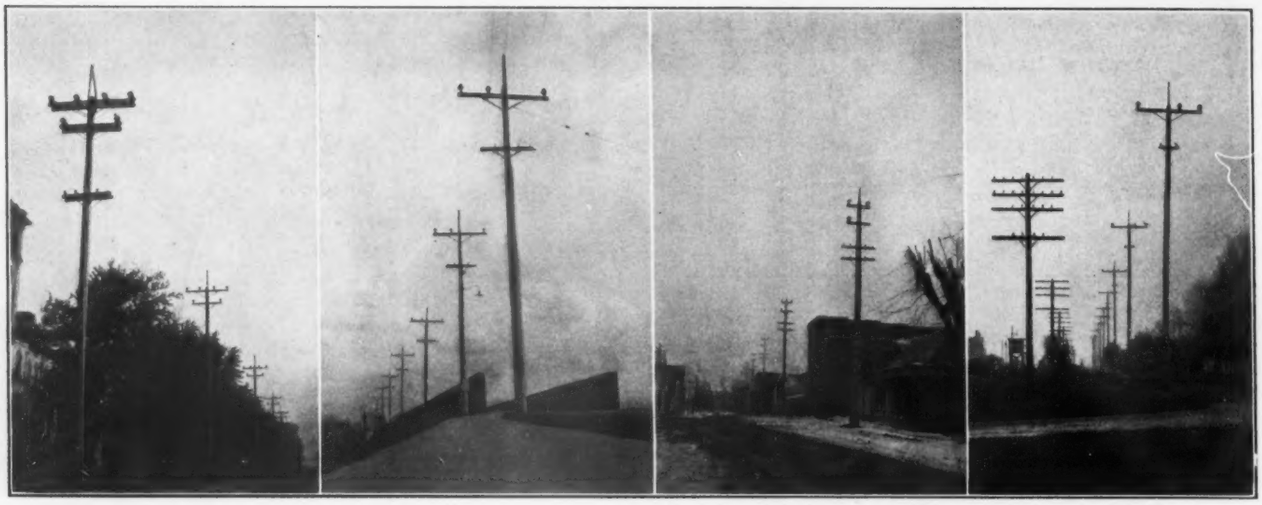
At the same time that all these advantages have been placed within reach of the inter-connected communities the standing of the company itself has been improved in many ways. The company has been able to effect investment economies and operating economies. It enjoys that greater security of position which comes from franchise diversity, and it finds its financing difficulties reduced to a minimum because of its ability to effect economies through its unit management.

Investment economies that have been made possible are of two sorts, namely plant investment and stores investment. At one time or another the three Illinois subsidiary companies have acquired 101 generating stations supplying energy to 131 towns. The total rating of these plants was 29,518 kw. The arithmetical sum of the peak loads of these original stations was about 23,600 kw. That is to say, the individually operated generating stations were operating or holding ready for operation 98 kw. per 100 customers then on their lines, and on the peak carrying an average load of 78 kw. per 100 customers. At the present time the same companies are operating forty-three generating stations with a total rating of 40,000 kw. and are supplying energy for 204 cities, towns and villages. The arithmetical sum of the peaks of all these stations, excepting those stations which are purely standby stations and are only operated occasionally, is 22,260 kw. This shows 70 kw. of generating equipment per 100 customers served and on peak loads only 40 kw. per 100 customers, counting both generated and purchased power, in spite of the fact that large mining and drainage loads have been added in locations where the lines of individual plants could never have hoped to reach.

It should be explained that the present generating equipment does not supply the entire amount of energy sold by the company. Where duplications of large existing investments can be obviated by the purchase of power from nearby established companies, interconnecting transmission lines instead of generating stations are built. Several such connections have been made to the lines of other operating companies. On



THREE TYPES OF OUTDOOR SUBSTATIONS WHICH ARE USED TO SERVE SMALL ILLINOIS TOWNS



TRANSMISSION AND DISTRIBUTION CIRCUITS ON SAME POLES—ILLINOIS PROPERTIES OF MIDDLE WEST UTILITIES COMPANY

the west connections have been made with the Mississippi River Power Company, which transmits electrical energy from its 150,000-kw. hydroelectric plant at Keokuk; on the east with the Terre Haute, Indianapolis & Eastern Traction Company; on the south with the Southern Illinois Railway & Power Company whose modern generating station is located at Harrisburg, Ill. In fact, the lines of the Central Illinois Public Service Company with those of the companies to which its lines are physically connected, will form an unbroken network reaching from the counties west of St. Louis to the eastern central counties of Ohio, when a fifteen-mile stretch of line is completed between the towns of Kansas and Paris, Ill.

Savings in Stores and in Operating

The investment in stocks of apparatus and merchandise which must be carried is relatively low. The company, with its increased buying power, can secure low prices, and with general stores properly located geographically, carrying stocks for large territories the necessity of each town carrying duplicate stocks is eliminated. It is said that the stores investment can be reduced about 50 per cent by the unit management plan. Four general stores serve the broad system of the Central Illinois Public Service Company.

The operating economies which have been possible are evident from the following conditions. Were the Central Illinois Public Service Company to-day generating electricity at all the different stations originally acquired it would be operating sixty-five pants instead of five central stations and twenty-one isolated stations. In this work 191 men would be employed instead of ninety-one. To carry all the company's business the services of 1500 employees would be required. Under the present organization plan the work requires but one-third of this number. The output of the sixty-five stations would have been limited to 13,000,000 kw.-hr. per year and these sixty-five stations to produce their ultimate output would have burned 134,500 tons of coal or 20.7 lb. per kilowatt-hour. To produce the 30,562,856 kw.-hr., the present annual output of the company's stations, has called for only 130,980 tons of coal, or 5.17 lb. per. kilowatt-hour. The sixty-five stations would have had an average load factor of 20.5 per cent, while the inter-connected system enjoys a load factor of 37.6 per cent, an increase of 83 per cent.

By combining properties for conservation it has been possible for the company to secure the services of men with greater individual initiative and the best engineering and operating ability. The broad scope of the company's activities offers these men opportunities which seldom exist in small-town plants operated as individual units.

Further, the advantages which have accrued to the company on account of the diversification of its franchises can hardly be over-estimated. The company's officers realize that it is difficult to conceive of a catastrophe which could materially effect its operation. Trouble which might arise in a community and prove fatal to an individually operated company would affect only slightly the business of such a concern as the Middle West Utilities Company.

Unified Plan Produces New Managers' Problem

From the company's viewpoint the unit management plan has also some disadvantages. Specifically there seem to be three sources from which trouble creating these disadvantages arises. (1) The local city council, (2) the small-town newspaper which has socialistic tendencies, and (3) the people themselves. These three groups might aptly be labeled "manager problems," and like all other problems, each permits as a rule, of some solution. The socialistic newspaper is perhaps the exception, for most of the managers concerned are, up to the present, still searching for an effective and convenient solution of this problem.

Fortunately remedies have been found for most of the other troubles. Broadly, the remedy lies in giving good service in every sense; courteous treatment of customers and liberal policy in line extensions with service continuity. The men who direct the company's affairs realize that they must learn the psychology of the small town. That they must see to it that the local company's representatives take an active part in affairs that interest the local business men and their customers; that they must let the electric light company become known, not as a great capitalistic enterprise in a far-off city, but as a local business house which always stands ready to support any movement for local civic or industrial betterment. In short, the solution of "manager problems" cannot be worked out in a day or in a year, but can only be successfully solved by a continuous educational campaign which is systematically conducted in a way to secure the confidence of the public.

As a side light on these problems it is of particular interest to note the difference in the feeling of the public toward the company in towns which have had service prior to its organization and in towns where the first electric lights were brought to them by the Middle West Utilities Company. This difference in feel-

ing has been sensed throughout the fields of all the properties, but tangible evidence of its results is best seen in individual examples. The towns of Danforth and Clifton had no service until it was supplied by the Central Illinois Utilities Company. The town of Loda had service before the Central Illinois Utilities Company acquired the property. The population of Danforth is 410, that of Clifton is 634, while that of Loda is 603, and there are electric customers in the three towns as follows: Danforth, 97; Clifton, 114, and Loda only 73. The towns in which electric service is comparatively new are usually considered more profitable towns than those in which service was formerly given by another company, for more customers per unit of population can be secured in a small town where service is new than in a like-sized town where twenty-four-hour service or night service only has formerly been available.

Three years ago the officers of the Middle West Utilities Company had a very clear idea as to what sort of a system would be developed from the 101 odd generating stations they had then acquired in Illinois. That they had at that time visualized the transmission system which would grow to its present extent, and that they were able to predict the economic gains which should result, is proved by the fact that these plans as now realized were set forth in the convention issue of the ELECTRICAL WORLD May 31, 1913. Looking still further forward these men see the already large interconnected system continuing to grow; the present subsidiary companies inter-connected; the number of isolated small plants continuing to decrease, and the time when more cities, towns and villages will be receiving twenty-four-hour electric service from transmission systems than are given service to-day by the steam railroads.

Present Status of the Water-Power Situation

A Review of Essential Considerations When Comparing Steam and Water-Power—Factors That Have Hindered the Building of Water-Power Plants—How Difficulties Can and Should Be Eliminated

BY H. W. BUCK

Vice-president Viele, Blackwell & Buck, New York City

THERE is probably no branch of engineering quite so confused and misunderstood at present by the general public and even by technical men as that connected with the development of water-powers. The mental chaos existing has brought this important industry to a standstill, with great economic loss to this country.

The advocates of the steam turbine plant proclaim loudly that the evolution of the steam turbine has put the water-power permanently out of business. On the other hand, the ill-informed and over-zealous legislators and so-called conservationists preach that water-power plants hold such a monopoly of the power supply of the country that this economic grip must be broken by force. Between these two adverse influences the legitimate development of water-power is being crushed.

In spite of the active competition between steam and water-power, which is in many instances unquestionably in favor of the steam plant, there are still a number of situations where a water-power development can be legitimately and profitably made. Furthermore, many new water-power developments will be made if rational legislation is passed by Congress which will give to such enterprises the required security.—H. W. Buck.

As in most engineering problems of a complex nature, there are so many variables involved that it is not easy to write equations to which any general solution can be given. Every instance has its individual points which must be carefully analyzed. It is true that steam turbine plants equipped with very large units, in localities where cheap coal is available, together with abundant low temperature condensing water, are able to produce power at a cost lower in some instances than water-power can be generated and transmitted over a long line to the same point. It is not fair, however, to make the comparison in this way. The question of load factor is a controlling one, and must be thoroughly reckoned with before a correct conclusion can be reached. In each case the cost of the water-power should be figured at the power station busbars, and the steam power cost estimated on the same basis. Then the cost of transmission should be added to both steam and water-power costs to obtain the final comparison. The severe condenser water requirements for the modern steam plant often require its location to be at such a point that considerable transmission expense is necessary for it as well as for the water-power.

Another common error lies in comparing the theoretical cost of steam-power with the selling price of the water-power, which includes a profit. No steam central

station is likely to sell power at cost. Furthermore the "costs" frequently quoted for steam-power are switchboard costs only, and do not properly include fixed charges and other general items of expense.

Steam-Power Situation at Buffalo

There has been much discussion of late regarding the status of a large steam turbine station being constructed at present near Buffalo, N. Y., to be operated in conjunction with Niagara power. Loose and incorrect conclusions have been drawn from this fact as showing that steam-power has now surpassed Niagara power in economy. The situation at Buffalo is a special case. In the first place, Niagara power is limited by law in extent and cannot be supplied to meet further demands in the growth of the Buffalo load. The matter of load factor also enters as an essential factor.

Niagara power, like all water-powers operating on a definite constant stream flow without storage, must be sold on the basis of maximum demand at a yearly rate. Niagara power, as is well known, is sold at a price which includes a profit of from 2½ mills to 3 mills per kilowatt-hour on the basis of 100 per cent load factor use. The Buffalo system, like any other general power system without an electrochemical load, cannot utilize power at 100 per cent load factor. If its load factor is, say, 60 per cent, then the the 3-mill rate on the 100 per cent load factor basis becomes 5 mills at 60 per cent load factor, and a cost is reached where the large steam turbine shows an advantage over water-power. Here again, however, the cost of steam-power is being compared to the selling price of water-power, which latter figure contains a profit. No steam-power station could afford to sell power on a 100 per cent load factor basis in competition with water-power from Niagara Falls.

In spite of the active competition between steam and water-power, which is in many instances unquestionably in favor of the steam plant, there are still a number of situations where a water-power development can be legitimately and profitably made. Furthermore, many new water-power developments will be made if rational legislation is passed by Congress which will give to such enterprises the required security. Public opinion is apparently swinging around toward a more sensible point of view with respect to water-powers, and the recent action by the Conservation Congress in Washington, in which extreme hostile views in the matter were repudiated, confirms this belief.

Electrochemical Industry as a Factor in Water-Power Development

The electrochemical use of water-power is becoming the greatest factor in the situation. The electrochemical business has been brought up on Niagara power and on the powers connected with the Great Lakes system, which are the only ones in this country that can deliver power at a constant rate throughout the year. There are, however, many large rivers in the country which can be developed at low cost for a power supply varying with the seasons, but with an enormous annual output in the aggregate at a cost per kilowatt-hour at least as low as from Niagara. It is to be hoped that the electrochemical industries can so adjust the commercial operation of their processes for variations in production with the seasons that such water-powers will become available.

Where public utilities are to be served requiring a constant power supply throughout the year the low-water season can be taken care of by combinations of steam and water-power, which in almost every case figure cheaper than either steam or water-power alone. The low capital cost of the modern steam turbine plant makes it financially possible to construct a steam plant as a part of a water-power system and shut it down for a considerable portion of the year without an excessive interest charge against the combined cost per kilowatt-hour.

An element inseparable from water-power development is the high-tension transmission line. During the past twenty years the limit of transmission has been extended at an average rate of about 10 miles per annum, and might now be placed at 200 miles. For the present the limit has undoubtedly been reached for the art as it stands to-day. Lines with respect to insulators, lightning and surge protection, etc., cannot be considered as satisfactory. This situation has caused hesitation in the use of hydroelectric power.

Reasons for Water-Power Development Stagnation

In brief, then, the stagnation existing to-day in the development of water-power is due to several definite causes.

1. Congress refuses to pass the necessary legislation for the use of water-powers on public lands or on navigable streams.

2. The development of the steam turbine has under certain conditions resulted in power costs lower than the equivalent water-power, which has led to the false doctrine that all steam-power is now cheaper than water-power.

3. The evolution of the high-tension transmission line has been so rapid that the troubles which have quite naturally arisen, some of a serious nature, have tended to discredit transmitted power.

There is no proposition so economically sound and which deserves encouragement from all sources in this country as the development of water-power. All of the above difficulties can and will be overcome in due time. The country needs water-power development, and it is going to have it, but will not take it on oppressive terms. Engineers can clear up the steam-hydraulic controversy by proper analysis of the facts and by the elimination of boasting as to economies on either side. The difficulties with the transmission line will be met and overcome, as other difficulties in electrical engineering have been eliminated by experience and ingenuity.

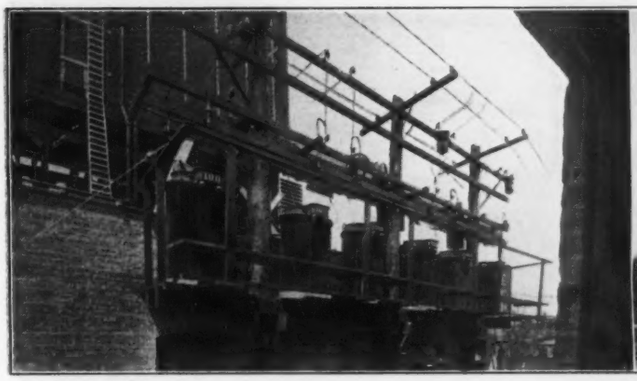
We need to preserve all of the coal we have in the country for use in heating processes where it can be utilized at an efficiency of 85 per cent. The use of coal for the production of power at an efficiency of 20 per cent or less, which is now about the maximum, should be discouraged, and this can only be done by the encouragement of water-power development.

Preparedness Wire and Radio Test Successful

The test made by the United States Navy Department on May 6, 7 and 8, to try out the preparedness of the nation in regard to telephone, telegraph and radio communication in case of war is reported as having been highly successful. Besides being in instantaneous touch with all naval stations in the country the department was in communication by means of wireless telephony with the battleship New Hampshire which was at sea.

On board the New Hampshire, apparatus installed by the American Telephone & Telegraph Company was used with the ship's antennae. To enable the ship's antennae to be used for both sending and receiving, the telephone instrument on board was equipped with a push button which so controlled the radio apparatus that it was possible only to either send or receive at one time.

Electrical Operation of Twenty Artificial Ice Factories in Chicago

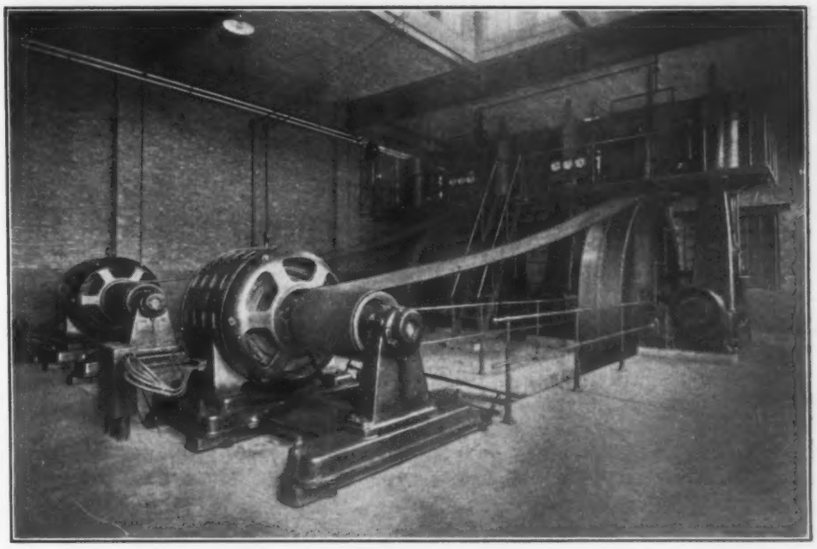


A 600-KW. TRANSFORMER INSTALLATION SERVING ICE-FACTORY LOAD ON COMMONWEALTH EDISON LINES

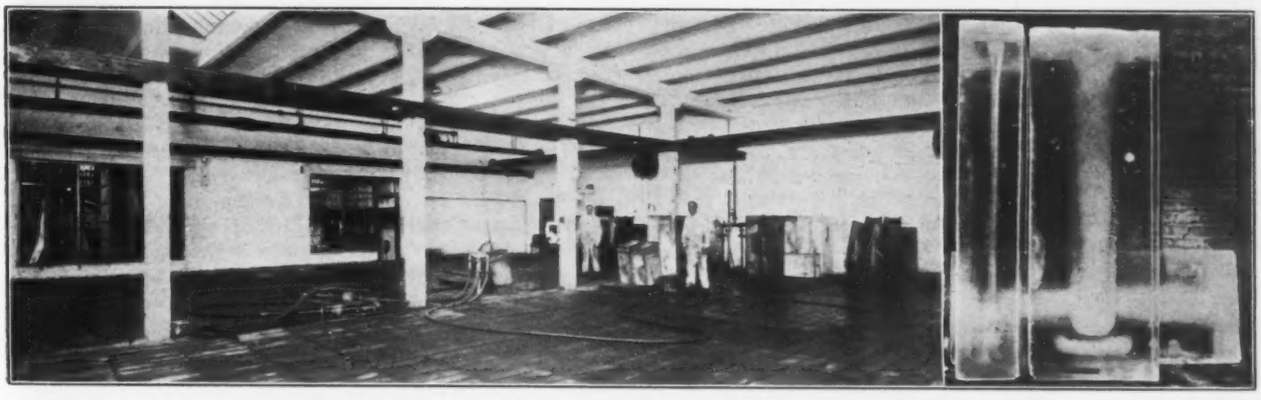
OLD STYLE WOODEN COOLING TOWERS HAVE BEEN FOUND TO GIVE THE BEST SERVICE OF ANY COOLING MEANS YET TRIED

STATISTICS OF SOME REPRESENTATIVE CHICAGO ICE FACTORIES OPERATED BY ELECTRICITY

Plant No.	Rating of Compressor in Tons	Connected Motor Load in Horsepower	Load Factor, Per Cent
1	120	600	72.8
2	180	580	33.3
3	180	540	46.7
4	180	520	—
5	120	475	29.7
6	105	452	61.5
7	80	435	—
8	90	410	39.6
9	120	390	44.8
10	100	351	—
11	75	330	37.8
12	140	310	30.8
13	80	285	51.5
14	60	220	49.8
15	50	200	30.1

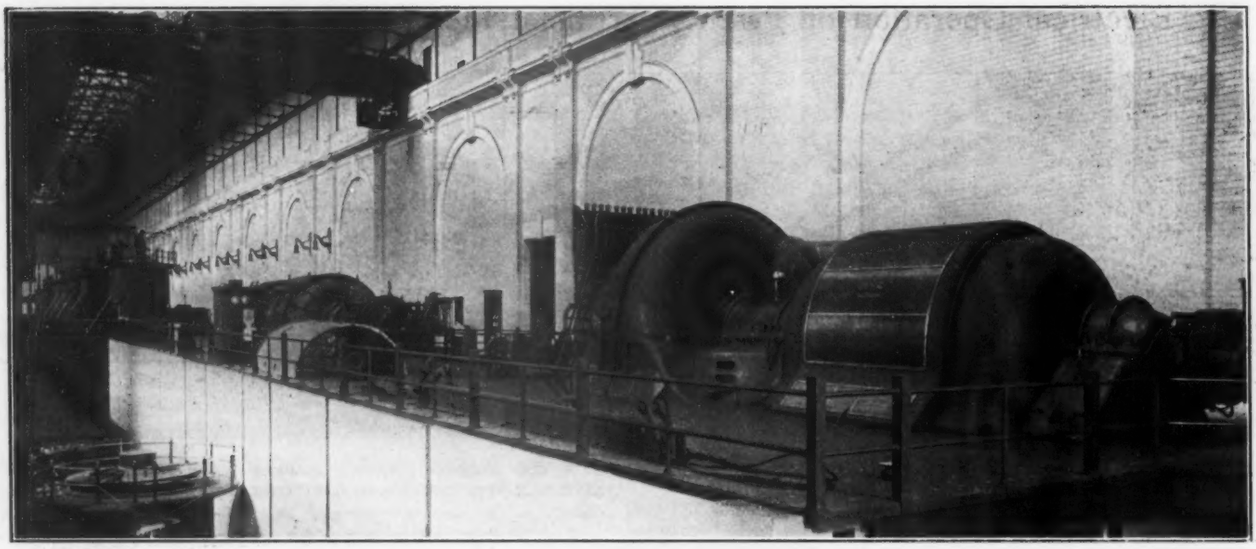


TWO 70-TON VERTICAL COMPRESSORS BELT-DRIVEN BY 200-HP. WOUND-ROTOR MOTORS IN CHICAGO ICE FACTORY



THE TANK FLOOR IN ELECTRICALLY-DRIVEN ICE FACTORY OF THE CONSUMERS COMPANY, AND SAMPLE CAKES FROZEN OF RAW WATER. NOTE THE VERY SMALL CORE WHICH RESULTS FROM IMPROVED PROCESS OF DRAWING OFF CORE WATER DURING FREEZING

The Commonwealth Edison Company now furnishes electrical energy to operate twenty ice factories in Chicago, as above noted. Eighteen of these plants were operated during 1915, seventeen of the number being raw-water plants and the eighteenth using the distilled water process. The eighteen plants above referred to produced 300,000 tons of ice during 1915, representing about 15 per cent of the total ice consumption of the city. The plants totaled 6500 hp. in connected load and used 15,500,000 kw.-hr. during 1915, a little more than 1 per cent of the total energy output of the Commonwealth Edison Company for the year, which was 1,220,000,000 kw.-hr. The load factors of these ice plants averaged from 40 per cent to 50 per cent, although several installations reached load factors of 60 per cent to 70 per cent.



THE FISK STREET STATION OF THE COMMONWEALTH EDISON COMPANY, CHICAGO. IN THE BACKGROUND ARE THE 12,000-KW. VERTICAL TURBINES WHICH REPLACED THE ORIGINAL 5000-KW. UNITS. IN THE FOREGROUND APPEAR THE NEWER 20,000-KW. AND 25,000-KW. HORIZONTAL TURBINE-GENERATORS

The Trend of Central Station Development*

Résumé of Early Conditions in Chicago—Centralization of Generating Sources—Station Additions to Meet Future Requirements and Changing Characteristics of Peak Loads

By L. A. Ferguson
Vice-President Commonwealth Edison Company, Chicago

THE trend of central station development is not changing in direction although the development is continually broadening. Engineering plans which have proved successful in our great cities are now being, or are about to be, applied to the areas of less dense population. Formerly the problem was one of centralizing the energy supply for a few square miles of densely populated community, transmitting it economically at high potentials to other parts of the community and there retransforming it to usable voltages. Now the problem is becoming one of applying this same established practice on a more extensive scale. Were it not for the fact that the increasing diversity of demands for energy enters so largely into the problem, it would indeed be one of exact repetition.

The existence of this growth of diversity, however, gives the problem a different angle. The peaks of the great stations in the cities of this country are not coincident with those of the transmission companies serving the cities' smaller neighbors. It is probable, therefore, that the immediate future will see the Commonwealth Edison Company and those companies which are serving electricity to the remainder of the state of Illinois, exchanging power on a wholesale basis over high-grade transmission tie-lines constructed especially for that purpose. This will, no doubt, be especially true of the future development of the extreme southern part of Chicago and its suburbs where the Commonwealth Edison Company has no power houses and where the Public Service Company of Northern Illinois is building modern plants.

Experience Leading to Centralization of Generating Sources

A little engineering history will tend to show how this same general plan of development was worked out for Chicago, and indicate the results that were accomplished there. From these results some insight into what the future will bring may be gained.

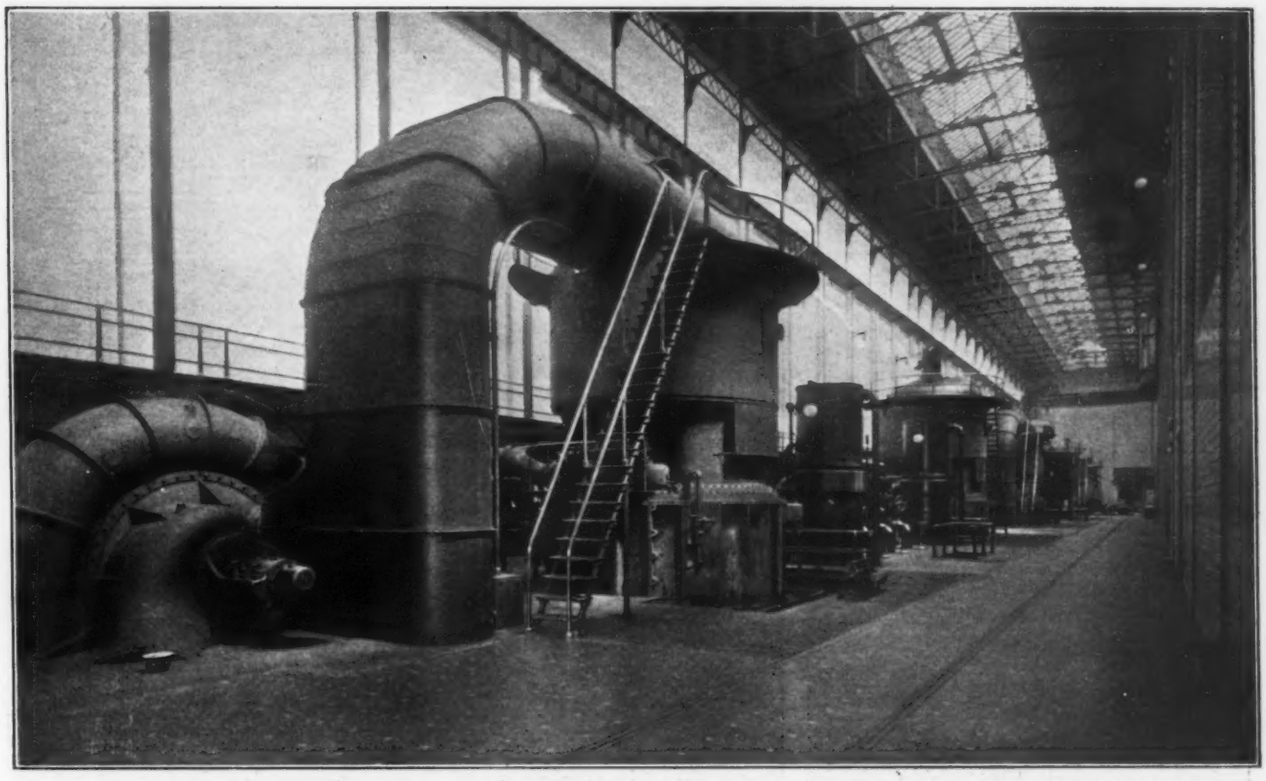
At one time there were more than twenty-five separate generating stations in Chicago, operating under many different managements. It required from 10 lb. to 15 lb. of coal to produce a kilowatt-hour in some of the outlying plants, while in some of the bigger stations with more efficient units, energy could be produced at a cost of about 6 lb. of coal per kilowatt-hour. It was observed that the peaks of these many stations were not coincident. The desire to take advantage of the lessons taught by these conditions brought about the adoption of the general plan in use to-day, namely, employing a few centralized generating sources operating in connection with many well-distributed substations.

Economies Resulting from Larger Generating Stations

To illustrate what economies this trend toward larger generating stations permitted the company to enjoy, we may trace the operating record of one of the largest stations of the Chicago company for the few years since 1903, when the Fisk Street Station was placed in operation, and the record of the company's substation practice since its inception in Chicago in 1896.

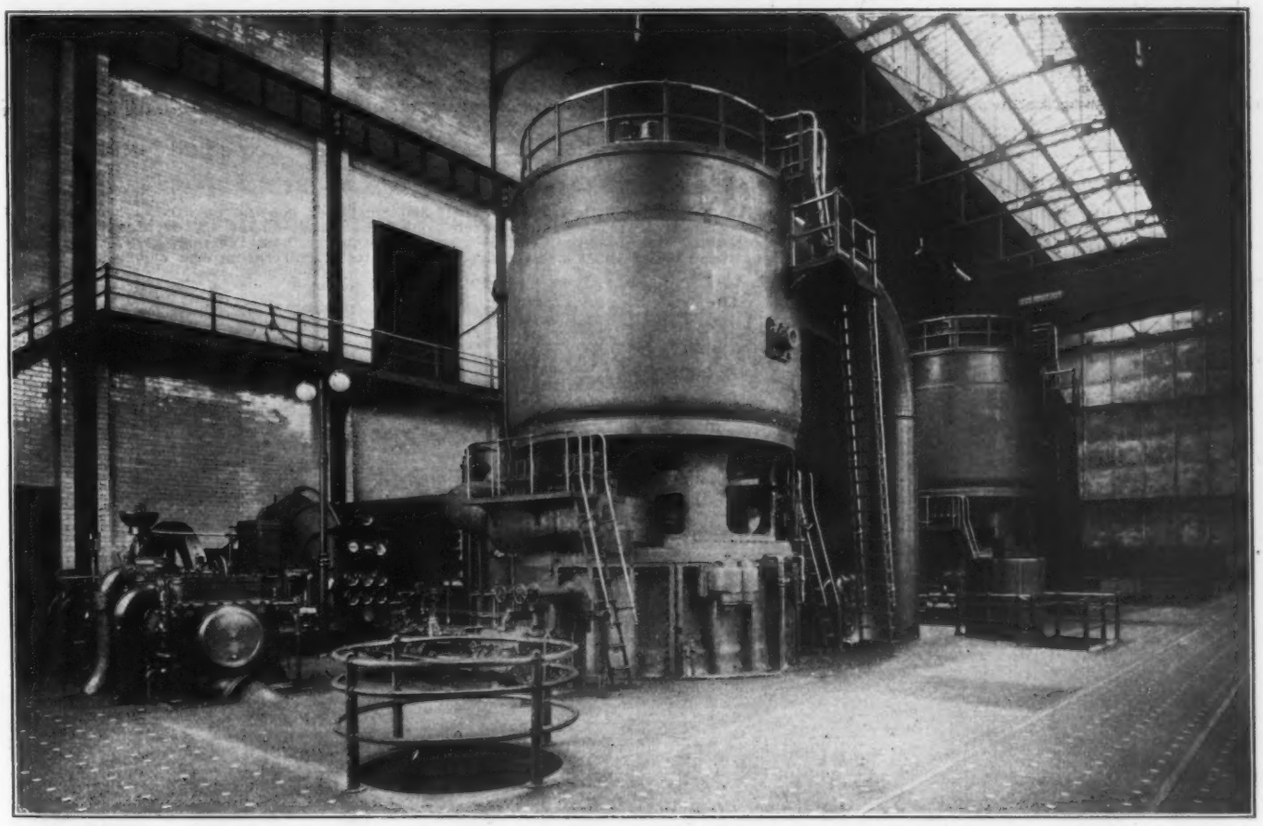
In the early days of the Fisk Street Station when the first three 5000-kw. units, which were more or less experimental, were installed, the unit fuel consumption of the station was 115 per cent more than that of the newest units in the station to-day. Likewise the investment per kilowatt in the early days of Fisk Street was 115 per cent greater than the investment per kilowatt in the newest units. The relative cost of attendance per kilowatt-hour produced was 170 per cent greater than it is at this time. Data covering the entire equipment in 1903 and in 1916 show that the space requirements in that period, only thirteen years, have been reduced from 146.5 cu. ft. per kilowatt of station rating

*Copyright, 1916, by L. A. Ferguson.



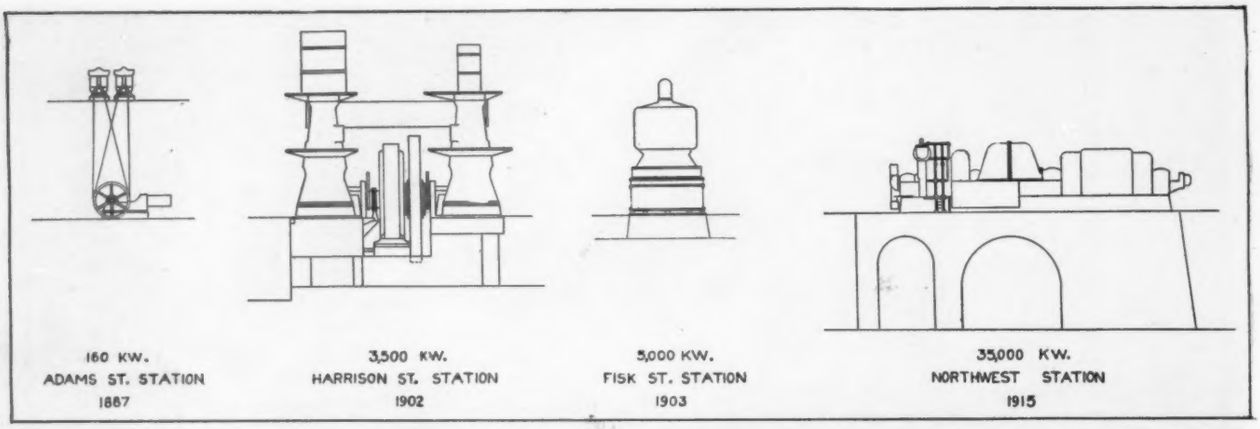
INTERIOR OF THE QUARRY STREET STATION CONTAINING 84,000 KW. IN TURBINE EQUIPMENT

The Quarry Street plant, which is directly across the river from the Fisk Street station, contains four 14,000-kw., 9000-volt, 25-cycle turbo-generators and two 14,000-kw., 12,000-volt, 60-cycle turbo-generators. The units are arranged alternately left and right so as to leave space between each pair of units for auxiliary machinery, thus simplifying the piping and the installation of pumps.

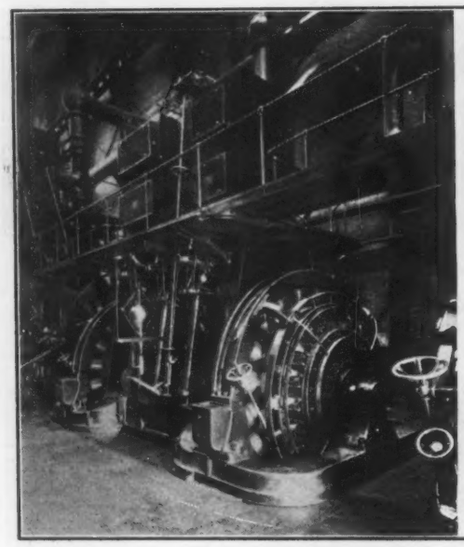


THE INITIAL PAIR OF 20,000-KW. VERTICAL UNITS IN THE NORTHWEST STATION

The Northwest Station is the third great plant to be erected by the Commonwealth Edison Company. It is situated in the northwest part of the city, and besides the two 20,000-kw. vertical turbine generators shown in the picture, contains a new 30,000-kw. horizontal unit. The latter is the first of the three large 30,000-kw. horizontal turbine sets which it is planned to install in this station.

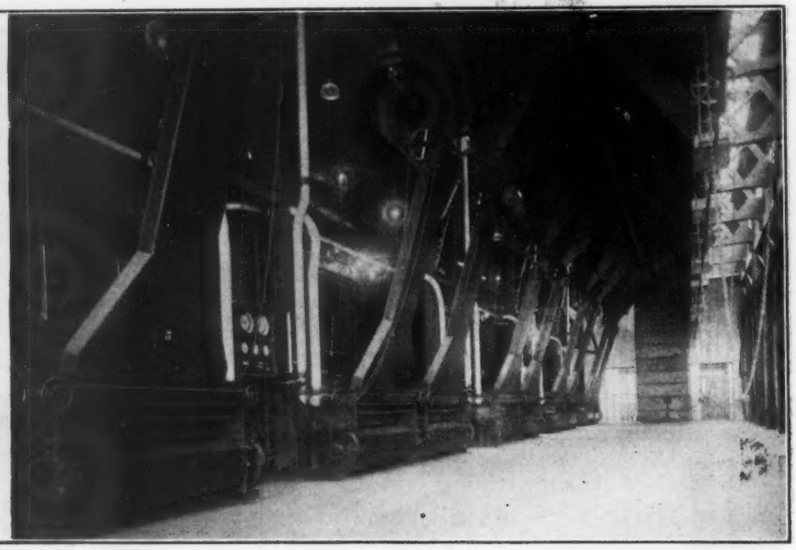


RELATIVE SIZES OF GENERATING UNITS IN SUCCESSIVE PLANTS OF COMMONWEALTH EDISON COMPANY, SHOWING TENDENCY TOWARD COMPACTNESS AND CONCENTRATION OF POWER GENERATION



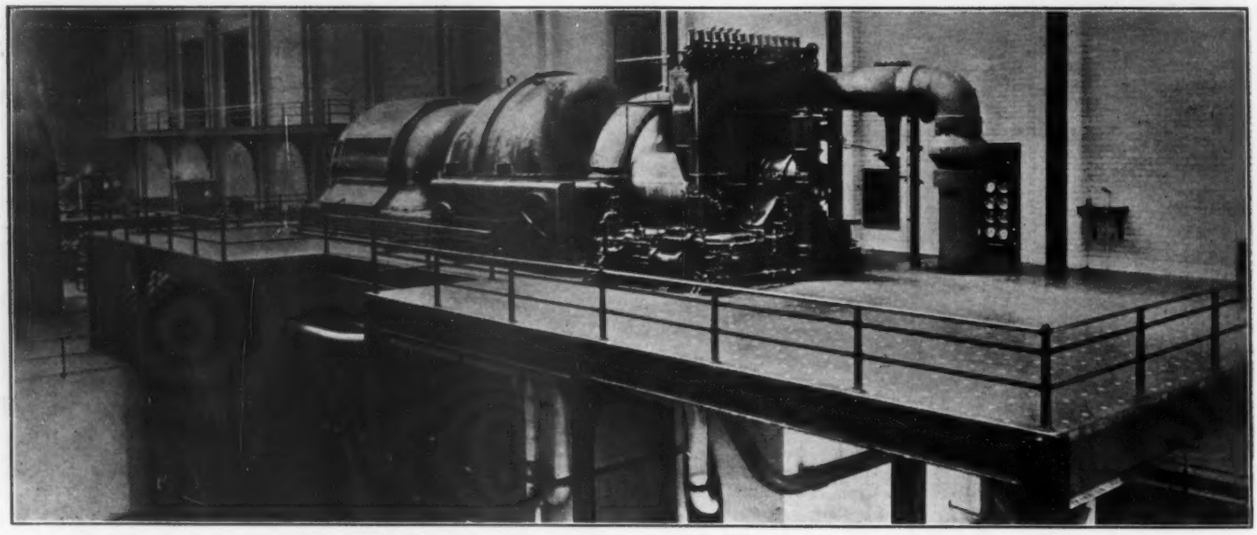
AN ENGINE UNIT OF 1902

One of the first direct-connected double-current generators in the old Harrison Street station. This plant was one of the first to transmit alternating-current to a substation for conversion to direct current.

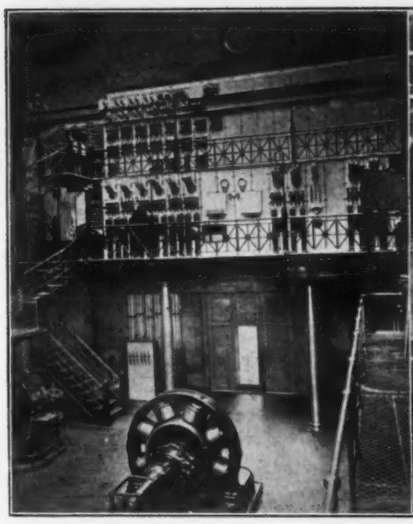


THE BOILER ROOM FOR THE NEW UNIT AT THE NORTHWEST STATION

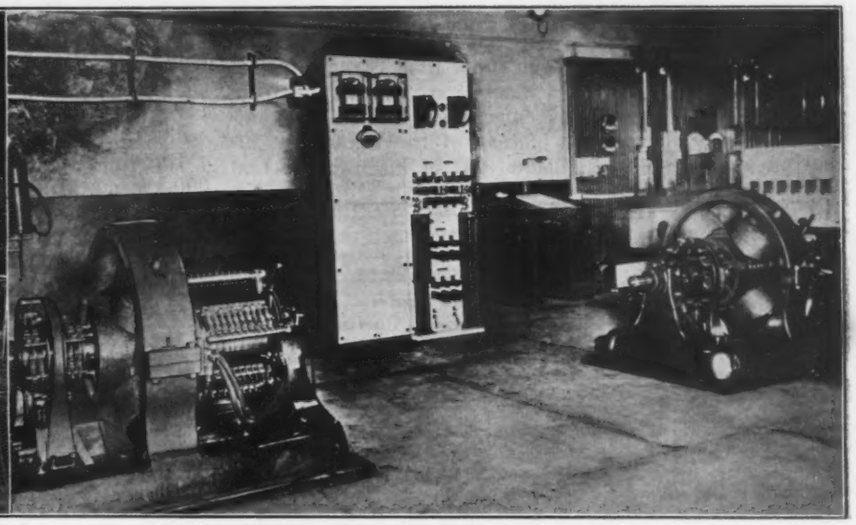
The five double boilers, each with 12,200 sq. ft. of heating surface, are operated at 250 lb. pressure. The output of each double boiler is 80,000 lb. of steam per hour. The economizers raise the temperature of the steam from 160 deg. to 270 deg. Fahr. All of these boiler units are required to operate at full rating the 30,000-kw. turbine pictured below.



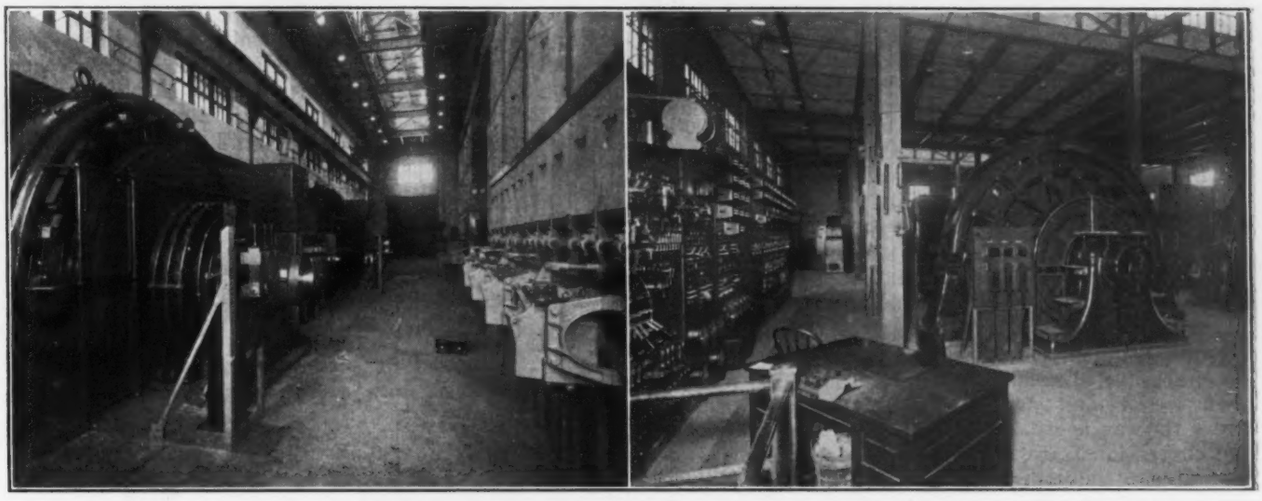
TURBINE GENERATOR NO. 3 AT THE NORTHWEST STATION—THE FIRST OF THREE 30,000-KW. HORIZONTAL SETS TO BE INSTALLED IN THIS PLANT. THE INITIAL 20,000-KW. VERTICAL TURBINE SETS IN THIS STATION ARE SHOWN ON THE PRECEDING PAGE



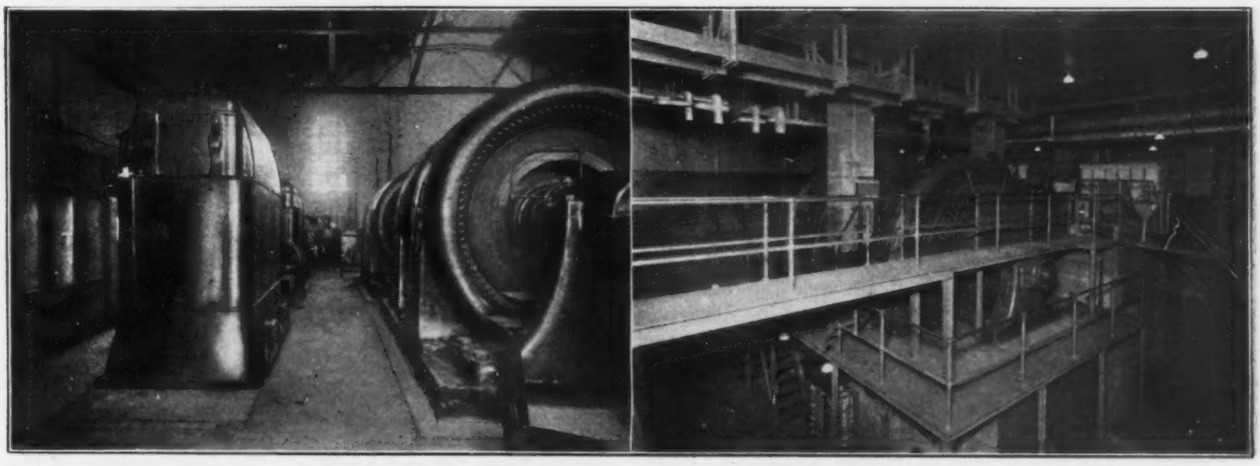
THE FIRST ROTARY INSTALLATION AT HARRISON STREET



THE INTERIOR OF THE OLD TWENTY-SEVENTH STREET SUBSTATION, SHOWING THE COMPANY'S ORIGINAL ROTARY CONVERTER INSTALLATION



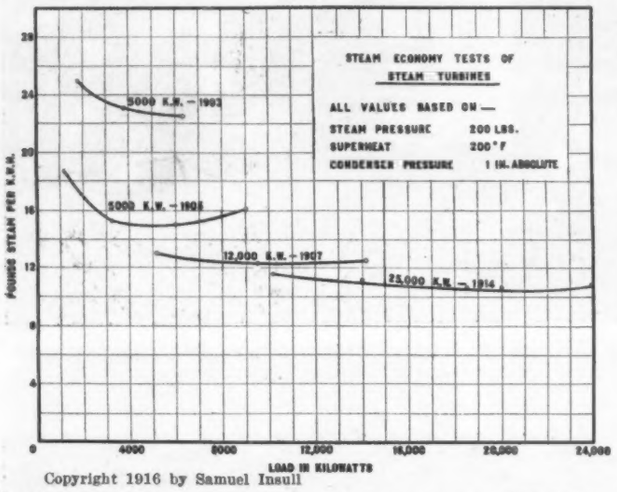
TWO SUBSTATIONS CONTAINING RAILWAY EQUIPMENT BUILT IN 1914. THE STATION AT THE LEFT WAS ERECTED AS AN EXTENSION TO AN EXISTING LIGHTING AND POWER SUBSTATION AND UTILIZES THE SAME OPERATING FORCE



THE ROSELAND SUBSTATION BUILT IN 1909 AND TYPICAL OF THE OLDER TYPE OF COMBINATION RAILWAY AND LIGHTING INSTALLATIONS, IS SHOWN AT THE LEFT. AT THE RIGHT APPEARS THE SHERMAN SUBSTATION BUILT IN 1912 AND TYPICAL OF SEVERAL INSTALLATIONS IN LEASED SPACE OF LARGE DOWNTOWN CHICAGO BUILDINGS

By using leased space in down-town buildings as in the case of the Sherman Street substation, the Chicago company eliminates the investment in high-priced property. At the same time this practice proves to building owners the true rental value of the space an isolated plant might occupy. In the basement installations water-cooled transformers and regulators are considered preferable because the heat liberated may be taken away from the building easily. Sometimes the heated water is sold for boiler feed water for the heating system of the building.

to 31.3 cu. ft. per kilowatt of station rating, showing the original requirements to have been 4.7 times as great as those of the present time. Fisk Street station as it was originally planned was to have housed fourteen 5000-kw. units, the largest machines possible at that time. To-day it contains instead of the 70,000 kw. of machines contemplated, 165,000 kw. of machines in ten



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STEAM ECONOMY TESTS OF STEAM TURBINES, 1903-1914

12,000-kw. units, one 20,000-kw. unit and one 25,000-kw. unit.

The advances in substation practice show a similar and perhaps more marked upward trend. Comparisons of the cost of attendance per kilowatt-hour produced, investment per kilowatt of rating and space requirements for some of the company's substations containing a few small units in 1897, and a modern 7000-kw. light and power substation are as follows: Attendance cost per kilowatt-hour produced, seven times as great then as now; relative investment, two and a half times as high then as now; and space requirements, thirteen times as great then as now. These records and the accompanying curves illustrate, of course, the downward trend of cost of electricity production, which is very similar to the trend of the curve representing the company's rates, reproduced on a preceding page.

FUTURE PLANS CONTEMPLATE 30,000 AND 35,000 UNITS FOR CHICAGO

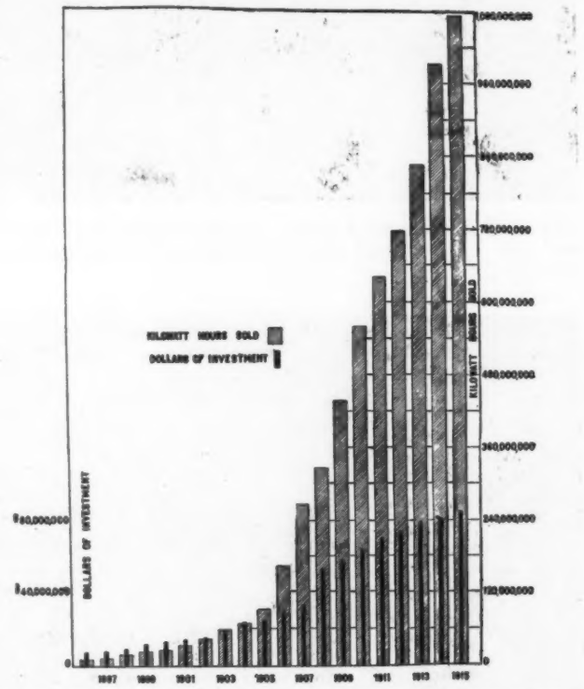
Though we may expect gradual improvements as time elapses it would be difficult to promise for the immediate future, at least, such further remarkable reductions in the cost of generating and distributing electricity. For, while higher steam pressures are being talked of and are being used experimentally to some extent, the immediate extension plans which the Commonwealth Edison Company contemplates follow the same general practice it has adopted in the last few years. That is to say, for the present the company will not install high-pressure steam units in any of its existing stations, since the apparatus for this class of service does not seem to be developed to a stage which would justify the very large investment its adoption would entail. The two units which will be installed at the Northwest station in 1917 will be rated at 30,000 kw. The plans for additions to the Fisk Street station in 1917 and 1918 contemplate the use of two 35,000-kw. machines. With the company's maximum load of more than 400,000 kw., as it will probably be in the winter of 1917-1918, the time of installation of these machines, units of 30,000 kw. to 35,000 kw. are thought to be ample in size in view of the company's watchword—Service First. The company's 25,000-kw. storage-battery investment, which might formerly have been relied upon in case of failure of a large unit, would be of comparatively small value in replacing the loss of a 50,000-kw. generator, were such a machine operating on the company's lines.

FURTHER ECONOMIES IN GENERATION EXPECTED

But in spite of the fact that these 30,000-kw. and 35,000-kw. machines will perhaps be only slightly more efficient than their immediate predecessors, further economy in over-all generating cost will no doubt be attained. This will be brought about by developing the systems of the Commonwealth Edison Company and the surrounding companies, so that advantage may be taken of the diversity of generation, as well as the diversity of demand. The ultimate result, of course, will be further conservation of coal, further reduction in cost per kilowatt of investment, further reduction in operating costs, and further reduction in the cost of service to the consumer.

CHANGING TENDENCIES IN PEAK LOAD CHARACTERISTICS

While the trend of central station development is maintaining its direction, the important characteristics of the loads in some cases may be expected to change. At Chicago, in fact, the change has taken place. Years ago when lighting and power demands were the prevailing load producers, the percentage of sunshine was the determining factor in the production of each year's maximum load. With the introduction of railway business, however, the percentage of sunshine is no longer of prime importance. The company's 25-cycle peak for the coming winter will be about 295,000 kw., while the 60-cycle peak will be about 97,000 kw. That is to say, the maximum load of the railways is a large per cent of the company's maximum load. Furthermore, the peak of the railway load is very largely influenced by



RELATIVE GROWTH IN INVESTMENT AND IN ELECTRICAL ENERGY SOLD

energy taken for car heating. The temperature of the atmosphere, therefore, and not the percentage of sunshine is now the determining factor in the company's peak.

This change in the important characteristics of the load has not been brought about by an increasing ratio of 25-cycle to 60-cycle business, because the present

ratio has been maintained almost constantly since 1896. But the absolute growth of both the 25-cycle and the 60-cycle load has brought about a condition wherein the percentage of total energy of either frequency, which can be interchanged through frequency changers, is relatively very small. Hence the effect of the car-heating load on the total has increased.

ILLINOIS DEVELOPMENT NOT UNLIKE CHICAGO'S

To summarize, the writer believes it may be said that the trend of central station development in Illinois for the immediate future will largely follow established practice in Chicago. The ruling principle which will control the trend of the development will be that which teaches the necessity of taking advantage of load diversity to effect conservation and to bring about operating and investment economies. The engineers who solve the problems will have to deal with a few stations of great capacity, with transmission lines of high ratings and still higher factors of safety, and with distribution systems serving areas much broader than those now embraced by existing systems.

One Year of Commercial Achievement

A Retrospect of the Past Twelvemonth, with Its Industry-wide Co-operative Movements, Rapid Increase in Industrial Uses of Motor Drive and Electric Heating, and Successful Electric Cooking, Flood Lighting and Electric Flag Campaigns

FOR the commercial side of the electrical industry the twelve months since the last N. E. L. A. convention have been rich in achievement. Into the home the story of electricity—and of electric cooking in particular—has been carried with a practical emphasis that promises henceforth the rapid development of the all-electric household.

In shop and factory, too, new fields for motor service, electric heating, and electrochemical applications have been opened up. Highly significant, moreover, is the fact that with returning industrial prosperity and the present urgent demand for manufactured products, factory operators everywhere have invariably turned to electric motor drive and central station service for the extension of their existing power facilities, regardless of the nature of the former power equipment.

In the Manufacture of Electric Steel the United States Now Leads the World, Having Advanced During the Year from Its Position in Fourth Place Twelve Months Ago

In the field of industrial electric heating many new shop uses have been found, and an important electric furnace load has been latterly developed. In the matter of electrochemical applications particularly the upsetting of the scale of values of commodities by the war in Europe has made it possible to conduct certain electrochemical processes—such as the electrolytic manufacture of bleaching material by laundries—at a substantial saving, although formerly these same processes could be carried out economically only on a comparatively large scale.

THE "ELECTRIC FLAG" AND OTHER CAMPAIGNS

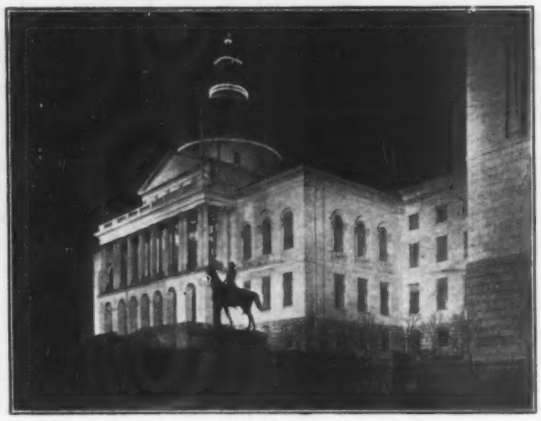
The awakening of national spirit in these stirring months has been reflected, too, in the wildfire spread of the electric flag emblem, and in its use as an educational and decorative element, East and West, North and South. Flood lighting of public and business structures, signs, etc., taking its cue from the departed glories of the San Francisco exposition, has constituted another distinct movement in the field during this same twelvemonth.

But of prime importance with respect to the whole electrical industry there stand out, of course, the two great co-operative campaigns—Electrical Prosperity Week in November and December, and "Wire-Your-Home" Month in March and April—both of which served to demonstrate to contractor and central station, dealer and manufacturer, the practical value of harmonizing all interests in advancing the common cause—the broadened use of electricity.

The stories of Electrical Prosperity Week, and of its sequel in house-wiring month, are yet fresh in the minds of every reader, and need no repeating here. It may be pointed out, however, that Electrical Prosperity Week marked one of the first co-operative steps to enlist all branches of the field, and so is bound to become a milestone in the history of the industry. As the weeks have rolled by since the close of the Week, fresh testimony of its results presents itself in the aftermath of better public understanding, in increased business for dealers, contractors and central station, and, most important of all, in the harmony brought into any local situations where previously discord had unhappily prevailed. And concrete evidence of the appreciation which Prosperity Week co-operation earned for itself among practical business executives is seen in the action of those companies which—slow to join forces in last November's campaign—this spring hastened to co-operate in the house-wiring movement of March and April.

Although the rise in prices of materials has been felt during the year in nearly all electrical construction and utilization—except in the cost of the all-important kilowatt-hours which have, on the whole, actually continued to grow cheaper—improvements in manufacturing, distributing, selling and construction may be relied upon to offset in part the rise in prices of materials.

Attempts to cheapen the cost of electrical construction along the lines of wiring practice in Europe have received practical tests during the year through trial installations of concentric wiring in existing dwellings



The Flood Lighting of Public and Other Buildings in Dozens of Cities During the Year Has Brought to Stay-at-Home Citizens Some Hint of the Night-time Beauties of the San Francisco Exposition Where the Method Had Its First Large-Scale Use

—the first three houses to be so wired in America having been connected to the lines of the Boston Edison Company. During the year there has also come the announcement by a leading American manufacturer that a line of fittings and tools for concentric wiring under conditions here is now on the market. In the illumination of the home a better appreciation of the artistic and illumination requirements is gaining in the popular mind, and with the highly efficient lamp units now available better lighting conditions than have ever before been possible are beginning to be realized.

ELECTRIC RANGES LARGE AND SMALL

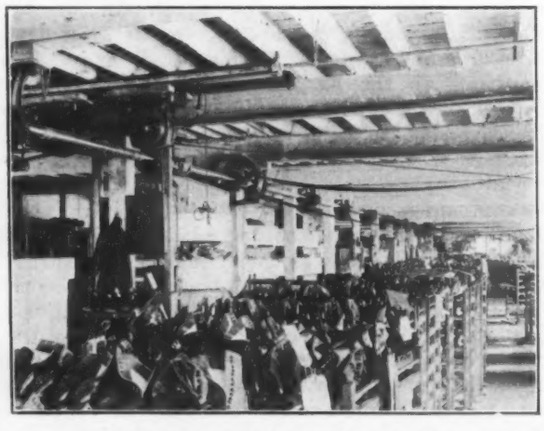
But it is probably in the field of electric cooking and the electric range that the most significant "drive" has been waged during these crowded twelve months. On the Pacific Coast, in central Illinois, and in the conservative capital of Massachusetts, centers of electric cooking activity at special low rates have been established, and the contagion has spread until now nearly 3000 communities—a good 30 per cent of the total number of service stations in this country—have electric cooking rates of 5 cents pere kilowatt-hour or less. Already several thousand ranges are in service in apartments and homes, East and West, and manufacturers have estimated that $1,000,000 worth of electric ranges will be sold during the present season.

Incidental to the electric range movement mention should be made of the far-reaching consequences of the novel step taken by one manufacturer during the past holiday season of marketing a toy electric range on which the junior cook can prepare small portions of all kinds as tastily as on a full-size stove. These novel and practical playthings have found their way into hundreds of homes, and besides demonstrating to interested mammas the conveniences of electric cooking, cannot fail to instill a knowledge of and desire for electric cooking in the rising generation of housewives.

The problem of electric water heating has been attacked, too, in many communities, and it seems likely that a solution will soon be reached through some plan of off-peak supply. But though the electric cooking and water heating problems seem in process of complete solution, announcement of the advent of a practical and economical small household refrigerating machine, to take the place of the iceman's daily 50-lb. burden, must, regrettably, be reserved for another year's summary. Certain it is, however, that when this domestic desideratum is finally achieved the demand for it will be even greater than that for the electric range itself.

In parts of the Northwest, where cheap water-power is available, the electric heating of dwellings and of public and business buildings continues to be carried out on an extensive scale. The cleanliness, simplicity and perfect temperature control of the method admit of no argument concerning electricity as the ideal means of heating, but unhappily these elysiums of low-cost surplus energy are so restricted that such electric heating is of little general application.

Whatever conclusions the central station man in town may have reached concerning the desirability of the farmer as a customer, the demand of the rural user for modern comforts, including electricity, has resulted in the sale of a large number of farm lighting sets for isolated service. These outfits, complete with gasoline engine and storage battery, are automatic in operation, and by educating the country householder to the advantages of electricity, are preparing him to be a good central station customer when the transmission network shall have penetrated the remoter rural regions.



With the Return of Prosperity During the Year and the Sudden Urgent Demand for Manufactured Products, Factory Owners, Forced to Make Power Extensions, Have Been Introduced to the Advantages of Motor Drive in a Way That Will Undoubtedly Influence Future Motor Development

NEW APPLICATIONS OF INDUSTRIAL ELECTRIC HEATING

It is in the field of industrial electric heating, however, that the growth in number and extent of applications has been perhaps most significant. On the one hand, electric furnaces have been developed to be practical central station loads, and on the other electric resistor apparatus is now being used for a variety of industrial purposes. Among these are the baking of varnish, enamel and insulation, baking of cores in foundries, sherardizing, colorizing, heating of rims of automobiles, operating annealing ovens for annealing copper, aluminum and glass; melting tin, lead and babbitt metal, etc. In all these fields the simplicity, safety and convenience of electric heat is establishing it in competition with gas, coal and other forms of fuel.

During the past twelvemonth the United States has become first among the countries of the world in the electric production of steel, gaining a leading position from its place as fourth just one year ago. In these twelve months the number of electric furnaces has been augmented by more than 50 per cent, and additional increases are expected.

The sudden demand for manufactured products, which developed with the return of industrial prosperity just prior to the beginning of 1916, has resulted in large increases in the motor installations of factories and shops. With the unexpected demand for increased

power facilities, manufacturers invariably turned to motor drive and usually to central station service, to augment existing equipment. The magnitude of this call for extra power is best evidenced, perhaps, by the million-odd kilowatts of turbine equipment installed by the central station industry during the year. The advantage thus gained for motor drive is bound to be permanent, and these "war order" installations are sure to be the means of introducing full motor equipment into many plants which otherwise might not have been converted for some years to come.

MOTOR DRIVE OF COAL MINES AND OIL WELLS

During the year a number of coal mines have been equipped for motor operation, using central station energy. The pioneer mine operators who first adopted electric power demonstrated the advantages of electricity for operating cutting machines, for hauling, for hoisting, and for pumping, and now many coal mines are being equipped for full electric operation. Oil wells, also, are being pumped by electric motors. Although this is a new field for electric power, the application is spreading, particularly in the Western fields, as the practical advantages of electric pumping become understood. Here, indeed, at the coal mine and oil well, where fuel is cheapest of all places, the theory of the isolated plant appears to have been finally demolished—for all cases, and all time.

The electric operation of ice factories continues to increase, and the last year has had its share in the development. In the sale of ice for domestic and general consumption, the cost of delivery represents a large part of the price paid by the purchaser. It becomes economical, therefore, in order to reduce the length of haul, to manufacture the ice locally by neighborhoods, and for power purposes, of course, electric drive is the logical solution. Chicago, for example, now has twenty electrically operated ice plants, averaging about 300 hp. per plant. Buffalo, Cleveland, Minneapolis and other American cities have similar electric ice factories, and even Winnipeg, far north as it is, supports a motor-driven ice plant in competition with the natural ice crop —which, at latitude 50 N., is never known to fail.

The growing use of the flood lighting of buildings for special decorative purposes has had a counterpart in the increased application of this method for illuminating signs. The flood lighting movement has, within the year, spread over the country, and, from its inception as an exposition lighting feature at San Francisco, is now largely taking the place of temporary outline lighting with bare incandescent units. Besides the lighting of signs and business buildings, commercial applications have been found for this flexible and easily installed system of lighting, in the illumination of ice-harvesting operations, skating rinks, tournaments, pageants, race courses, etc.

For the electric flag campaign a psychological moment of intensified national spirit was seized during the year, and hundreds of these emblems have been installed on public buildings, in schools, in theaters, in stores and even in factories where alien workmen are employed, as lessons in practical patriotism.

In the electric vehicle field the increasing use of electric trucks by transportation companies and by government bodies has been a matter of comment. In Detroit and other cities the electric taxicab has won such popular favor and shown such economical operation that one of the local large taxicab companies is replacing its fleet of gasoline cars with electrics, some seventy of which are now in operation.

The year has been particularly signalized, however, by the development of the so-called "industrial electric truck." In factories, shops, warehouses, steamship docks and railroad freight terminals, the economy of storage-battery-operated trucks in place of hand trucks is being more and more recognized as, each year, the use of these handy conveyances increases.

The Hundreds of Electric Flags Which During the Year Have Flashed Out Across the Nation, Have Their Patriotic Lesson for Citizen, Schoolboy and Alien

Among the minor movements of the year may be noted the effort on the part of manufacturers of electrically played pianos to bring about, in co-operation with local central stations, more adequate appreciation of the artistic values of the present-day electric piano —devices which, despite the handicap of the reputation earned by their early prototypes—offer the nearest approach to the subtleties of manual technique. The small phonograph motor placed on the market during the year, which can be connected to any of the popular disk-type machines by simply setting its pinion wheel against the revolving platform, has had a phenomenal demand, and by eliminating the tiresome cranking provides one more use for the "magic of the wires" in the home.

Looking back on the year, then—although perhaps no fundamental invention or wholly new application has been contributed by the twelvemonth just past—the period has nevertheless been one of unparalleled commercial development along many and diverse lines, a spirit of practical co-operation has been established throughout the industry, and the substance of the year's progress is to be measured in the broadened service which the electrical industry, directly and indirectly, is rendering the public.

In the Far West, Middle West and East, the Electric Range Has During the Past Twelve Months Received Powerful Impetus Through Special Cooking Rates Now Offered in Some 2800 Communities

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Dayton's Total Transformer Rating About 143 per Cent of 1915 Peak Load

According to a recent analysis which the Dayton (Ohio) Power & Light Company has made of its transformer installations, the actual demand (based on the annual peak load for 1915) represents 70 per cent of the total rating of the transformers. The ratio of the average load in March, 1916, to the total transformer rating was 34 per cent. It may be pointed out that there are 1019 transformers having a total rating of 21,044.8 kw. in the Dayton city district. Of these 874 are single-phase units and 145 are three-phase designs. The average rating of the single-phase units is 15.35 kw. and that of the three-phase units 52.6 kw. The single-phase transformers range in rating from 0.6 to 333 kw. and the three-phase units from 5 to 500 kw.

Method of Severing High-Tension Lines While Energized

The accompanying illustrations show the construction of a safety high-tension wire cutter employed by the Southern California Edison Company to cut live transmission line conductors. According to George P. Wicker of that company, a defective section of a 2200-volt line was severed from the remainder of the system with this device during a driving rain in less than three minutes. Rubber gloves and ordinary wire cutters, it is said, could not have been depended upon with impunity because of the rain. High-voltage main-line wires have also been cut under heavy load. When using this device the wire is first nicked or partly cut with it, then the wire is grasped in the cutter at one side of the nick and bent back and forth until the nicked section fails, thus preventing the arc from burning the cutter.

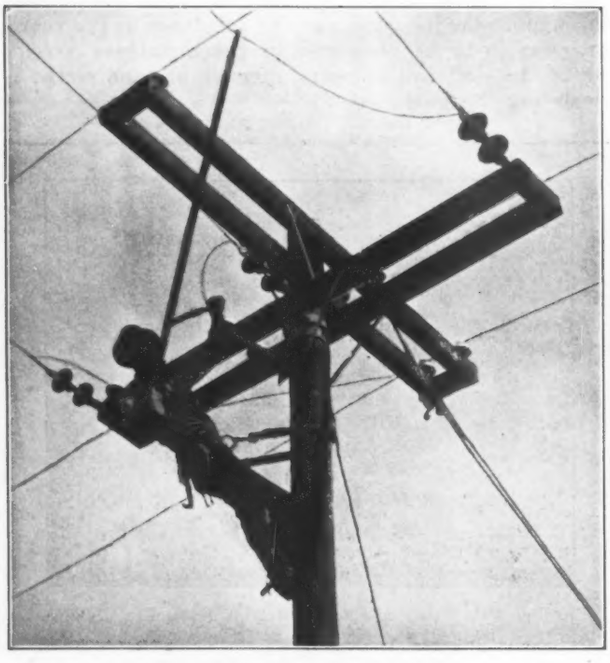


FIG. 1—CUTTING A 15,000-VOLT TAP WITH A SAFETY DEVICE

The cutter is made up, as the illustrations show, of two cutting blades, one attached securely to a jaw and the other made to approach it in the same plane, but at an angle to the cutting edges, thus producing a combined sliding-shearing action. This, it is said, will sever a wire with less power than the shearing action

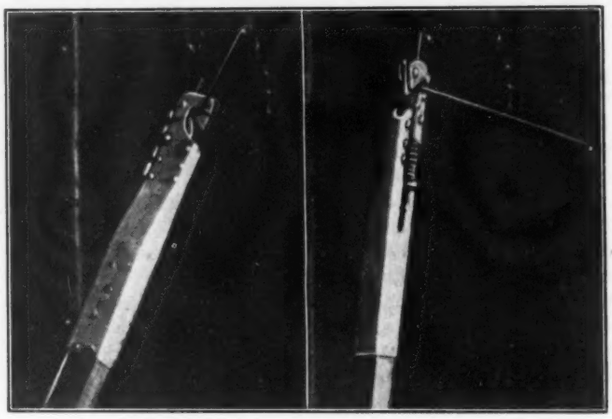


FIG. 2 AND 3—POSITION OF DEVICE IN ACT OF CUTTING WIRE AND AFTER CUTTING SHOWING WIRE HELD IN ITS GRIP

alone requires. The cutting blades and the frame holding them are attached to one end of a well-seasoned insulated handle about 5 ft. long. Near the other end is a lever which actuates the movable cutting blade through a toggle joint. When the device is not being used the lever lays against and parallel to the cutter handle. One of the most interesting parts of the device is a mechanism at one side of the cutter blades which holds one end of the wire cut until the cutter-operating lever is released. A heavy spring is inserted between the holder and the cutter-operating mechanism so that the two operate in conjunction and still the holder is permitted to adapt itself to any size of wire.

Before this cutter was devised it was common practice, when a set of high-voltage taps were to be cut, to either shut off the current or, where this was not feasible, to cut the taps with a pair of short-handled tree pruners. The latter course is always a dangerous process, because it is doubtful in which direction the loose end of the tap will spring. It may strike the lineman or it may flip directly into a wire of another phase. In either event serious results will usually occur. When using the safety cutter, however, it is only necessary to turn the holding side towards the long end of the tap, or the end of tap that is liable to give trouble by flipping. When this is done and the wire is cut, the long end of the tap remains firmly gripped in the holding device. The lineman can then shove or pull the long loose end to any position he chooses before releasing it. In this manner a lineman can cut a 30,000-volt tap with little danger. The cutter is much safer to use than rubber gloves, since the latter may be safe one minute and defective the next.

Cost of Installing Street Lighting Cables in Boston

The Edison Electric Illuminating Company of Boston, Mass., has installed 2,644,518 ft. of No. 6, lead-covered underground cable in a recent five-year period at a total cost of $0.2524 per foot. The cable was insulated with 7/32-in. 30 per cent Para rubber compound, covered with a 3/32-in. lead sheath without tin, and guaranteed at a working pressure of 10,000 volts.

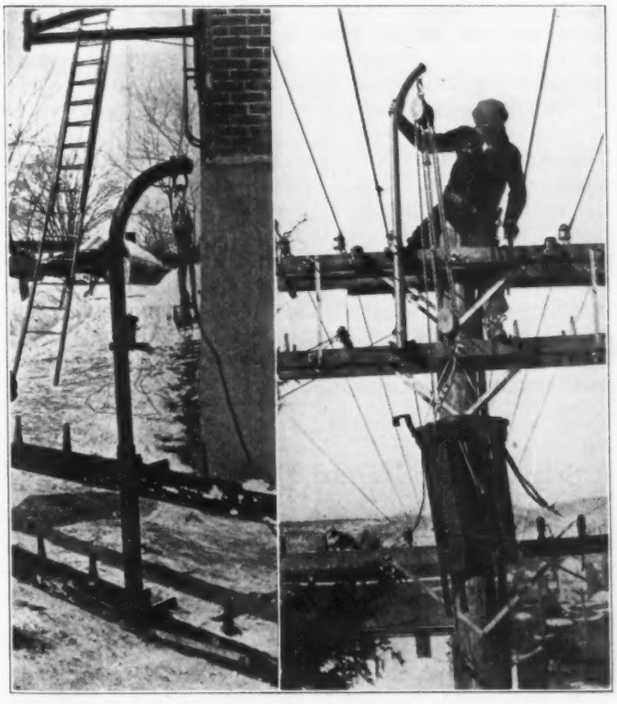
The cost of installation was made up as follows:

	Total Cost	Cost Per Ft.
Average cost of cable—2,442,628 ft. purchased		$0.1817
Installation cost, drawing in (by contract)		0.0110
Miscellaneous construction costs:		
11,526 bonding connections at $0.63	$7,261	
12,794 cable splices at $2.60	33,264	
102,044 cable protectors at $0.49	50,001	
350 standpipe collars at $1.61	563	
250 cable splices at potheads, at $2.60	650	
	$91,749	0.0347
Freight, teaming, stockroom expense, inspection at factory and after installation, testing, duct protectors, racking (with extra hangers), waste cable, installation under frost conditions		0.0250
Total cost per foot		$0.2524

Installing Pole-Top Transformer by Aid of Portable Crane

BY N. M. LONGBOTHUM

Illustrated herewith is a portable pole-top crane being used by the Connecticut Power Company at Thomaston, Conn., to hoist a 15-kva. transformer to the top of a 40-ft. pole. The crane is made in two sections. The top consists of a 2-in. pipe 5 ft. long reinforced on the inside by a size smaller pipe. This top part is shaped like the davits used on ships and equipped with a U-bolt at the upper end for holding a block and tackle. The lower section is a sleeve made of 2.5 in. pipe 28 in. long. Attached to the lower end of the crane and on the sleeve which may be slid along the pipe are claws that may be hooked over two cross-arms to hold the crane in position for use. The lower section is clamped on the cross-arm and the top section is dropped inside and rests on a pin riveted through the bottom of the lower section.



HOISTING 15-KVA. TRANSFORMER ON 40-FT. POLE WITH POLE-TOP CRANE

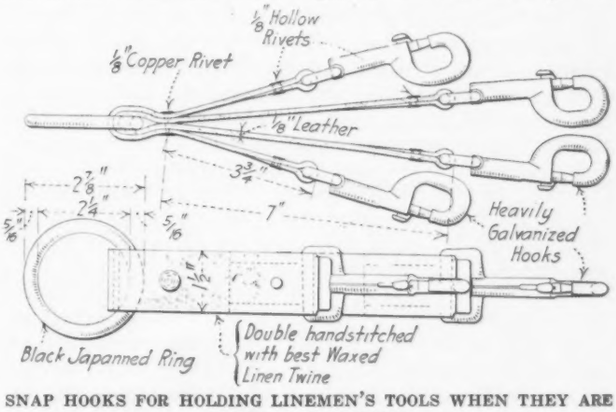
As indicated two-wheel blocks were employed in this case. The lower block is attached to lugs on the transformer case by means of stranded guy wire, the ends of which are joined by a three-bolt clamp. The fall line of the tackle extends down the pole to a sheave fastened at the bottom and thence to a whiffle-tree to which a horse is hitched. The line tied around the transformer case is for guiding it into place.

This crane is made in different sizes by the Bristol Transformer Crane Company, Bristol, Conn.

Safety Attachment for Lineman's Hoist

BY R. A. PAINE, JR.

The lineman's safety hoist, illustrated herewith, which is intended for raising or lowering tools and materials from the top of poles, was devised by the Edison Electric Illuminating Company of Brooklyn. It consists of four snap harness hooks attached to leather straps, which in turn are fastened to a japanned iron ring through which the hoisting rope is threaded and secured. The various tools used on poles by linemen, with the exception of saws and braces, have been equipped with eyes to which the snap hooks may be attached. In each saw just below the handle is drilled a hole which serves the same purpose as the eyes on other tools. Braces can be hoisted by snapping the hoisting hooks over any part.



SNAP HOOKS FOR HOLDING LINEMEN'S TOOLS WHEN THEY ARE RAISED OR LOWERED

How a Revised Operating Schedule for a Small Oil Engine and Storage-Battery Plant Reduced Fuel Cost About One-Half

By revising the schedule for using and charging the storage battery in a combination oil engine and storage battery generating station at Perry, Kan., a reduction in fuel oil to about half that formerly required is reported by F. W. Bettys, superintendent of the station. The station equipment consists of a 30-hp. Alamo oil engine driving a 17-kw. Westinghouse direct-current generator, and a stand-by battery rated as 160 amp.-hr. at 110 volts, consisting of sixty-two main cells and eight end cells.

Under the former operating schedule, the engine unit was started at about 9 a. m. and run until 11 p. m. During this time about 30 gal. of kerosene and 1.75 gal. of lubricating oil were required. The storage battery carried the load from 11 p. m. to 9 a. m. the next day. According to the new arrangement the engine unit is started at 5 a. m. and the battery charged from this time until 8 a. m. while the unit is carrying the

morning load. The engine unit is then cut out and operated again from 5 p. m. to 11 p. m. The small day load is carried by the battery at all times that the engine unit is not running. Two days a week electric irons are used by customers, and on those days the engine unit is operated all day.

With this operating schedule about 19 gal. of kerosene and 1 gal. of lubricating oil is used a day. The kerosene costs 7 cents a gallon and the lubricating oil 26 cents a gallon. A reduction of 11 gal. of kerosene and ¾ gal. of lubricating oil, or a total saving of about $1 per day, is effected by the change in operating schedule.

A 12-Volt Emergency Control Battery

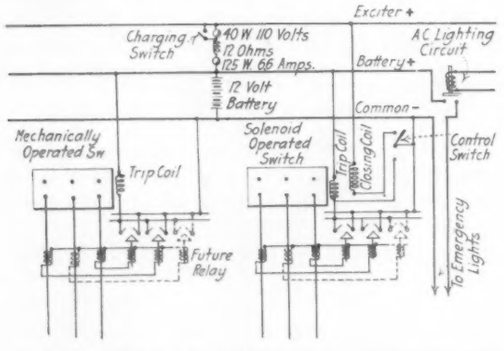
By Frank T. Coldwell
Superintendent Mohawk Hydro-Electric Company

To provide an unfailing source of energy for operating remote-control oil switches and emergency lamps it is customary to install a 55-cell storage battery and a motor-generator to charge it. For small stations the cost of the battery outfit is quite an item, and mechanically operated switches with transformer or so-called "current trip" are often used.

In its early form the transformer-trip scheme consisted of simple circuit-opening relays and a single trip coil at the switch. Later on it was found desirable to make the relays quick break and in some cases to provide two magnetically separate trip coils.

In the power house of the Mohawk Hydro-Electric Company, Ephratah, N. Y., the oil switches are mechanically operated and the trip coils were originally arranged to be operated from the exciter bus. Motor-driven exciters are used, and as a consequence the exciter voltage may fall so low, at the time of a short-circuit, that the trips will be found to be unreliable.

In order to save the expense of installing and maintaining a 55-cell battery the proposition of changing to transformer trip was first considered. This called for new relays and new trip coils for the present conditions of ungrounded neutral. If the neutral were ultimately grounded the switch mechanisms would have to be changed to those having two trip coils. Both grounding the neutral and the possibility of using remote control switches were considered, the arrangement shown in Fig. 1, suggested by the writer, being finally selected. The change consisted in merely installing a 12-volt bat-



CIRCUIT CONNECTIONS TO USE A 12-VOLT BATTERY TO OPERATE TRIP COILS OF OIL SWITCHES

tery and trip coils and wiring suitable for that voltage.

If the neutral is grounded a single-pole relay will be added to the equipment for each switch. If solenoid-operated switches are installed, the powerful closing coils will be operated from the exciter bus and the trip coils (about 50 watts each) from the battery. It has been found impossible to imagine a condition requiring an emergency battery to close switches if the exciter bus, and therefore the entire equipment, is dead.

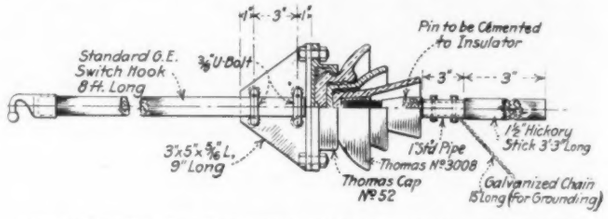
The improvements in low-voltage lamps have made it possible to install emergency lamps operated from the same battery with a very nominal expense for wire. The use of these emergency lamps saves enough in kerosene to pay interest on the entire cost of new equipment.

As may be noted from the sketch, the battery may ordinarily be kept under a light charge through a resistance consisting of a 40-watt, 110-volt lamp, a 12-ohm resistor and a 6.6-amp. series lamp. By short-circuiting the 40-watt lamp, the battery may be given about its normal charging rate, the 6.6-amp. lamp serving as an indicator. In the event of the exciters failing, the combined resistance of the 6.6-amp. lamp and the resistor will limit the "feed-back" from the battery through the generator fields to a small amount.

Construction of a High-Tension Switch Hook Handle

By M. M. Samuels

To afford security to operators at the Easton outdoor substation of the Pennsylvania Utilities Company special switch hooks are provided having a high degree of insulation between the hook and the handle. As illustrated, the device consists of a standard General Electric switch stick and a hickory handle fastened end to end but insulated from each other by a pin-type insu-



SPECIAL SWITCH HOOK WITH HANDLE HIGHLY INSULATED

lator. A ground chain fastened to the pin of the insulator makes the device safe to use even in a rainstorm. The insulator being near the hand facilitates the use of the device by reason of its added weight. It is used in operating 33,000-volt disconnecting switches.

The pin-type insulator is equipped with a cap to which is bolted a 3-in. by 5-in. by 5/16-in. angle, cut as shown. The standard switch-hook handle is fastened to this angle by means of ⅜-in. U-bolts. The actual handle for the switch hook, however, consists of a 1.5-in. hickory stick 3 ft. 3 in. long. This is attached to the insulator pin by means of a 1-in. standard pipe, which is bolted to the stick and screw connected to the pin. To this pipe is attached a 15-ft. galvanized chain, which may be connected with a low resistance "ground," thus assuring the operator of safety, even if the standard switch hook and insulator break down.

A Scheme that Furnishes Incentive for Rapid but Thorough Work in the Boiler Room

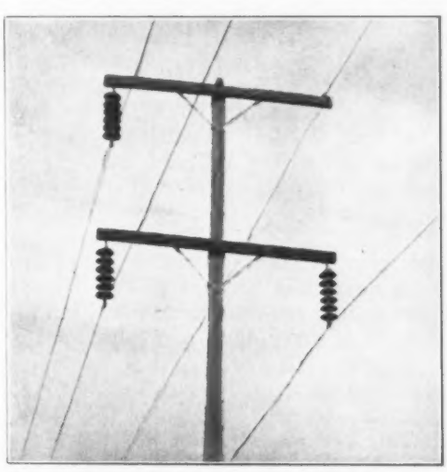
The monotony of routine duties frequently causes station operators to lose interest in their work. A method has been devised by an Eastern company which places the work of station men on a competitive basis and creates an interest and friendly rivalry in their work. The system applies to boiler cleaners, tube blowers and the like. Before this scheme was established there was a tendency for the tube blowers to wish to enter and blow the tubes while the cleaners were at work

below, thus causing annoyance. It is now compulsory for each set of men to clean three boilers properly before leaving for home in the evening, the first pair finishing being allowed to go home as soon as the work is inspected and pronounced satisfactory. As a rule the cleaning is performed on Sunday, on account of the light load carried as compared with other days. The men appreciate getting off an hour or two earlier on this day. Moreover the men who finish second are generally not far behind the first and are available for getting up wood for the new fires and other odd tasks. This system tends to secure both quick and efficient work. The men realize that if the work is not up to standard they will not be allowed to leave the station even though they finish first, but must return and correct the neglect or carelessness observed. The boilers are generally taken off the line at midnight preceding the cleaning. In order that the same two men shall not be the first through with the work every day, the men are paired off differently each time, the faster men being paired with the slower workers as far as possible.

In order to do away with the trouble caused by the blowers wishing to work in the boilers at the same time that the cleaners are on furnace work, the men are required to work the boilers in the order listed on the bulletin. In addition, the cleaners are required to report an hour ahead of the blowers, this enabling them to have a boiler cleaned when the other set of men is ready to enter and finish the cleaning by blowing the soot off the tubes. The blowers then enter the different passes, hook out all the clinker, and thoroughly clean the tubes with the steam jet. In this manner all opportunity for trouble is eliminated, for in arranging the order of the boilers on the bulletin the engineer sees to it that the blowers are always one boiler behind the cleaners.

A Rocky Mountain 100,000-Volt Wood Pole Line Construction

Although wood poles are not usually employed to support transmission lines operating at voltages as high as 100,000 volts, they were used for this purpose in the Rocky Mountains, where a line of that voltage had to

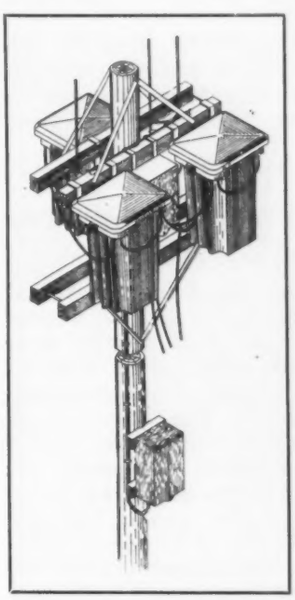


POLE TOP CONSTRUCTION FOR 100,000-VOLT LINE

be erected to connect the Montana Power Company with substations along the electrified division of the Chicago, Milwaukee & St. Paul Railroad. This construction was adopted because the roughness of the country compelled erecting the line along the railroad right-of-way. Single poles with conductors suspended, as illustrated herewith, from wood crossarms by six-disk insulators, were used except on long spans where double-pole H-construction was considered preferable. The fourth wire shown is a ground wire. From it a ⅜-in. wire extends down each pole to a "pancake" ground coil on the bottom of the pole, affording an effective ground, it is declared. To minimize the time required for connecting the ground wire with each "pancake" coil the ground leads were attached to the poles before erection, so that it was only necessary to connect the free ends with the ground wire and coil respectively when the wires were strung. Where there are turns in the line the insulators on the outside of the curve have been hung on galvanized brackets and the crossarms mounted off center to provide the standard clearance.

How a Transformer and Meter Installation Problem Was Solved in the Bedford (Ind.) Stone District

When installing equipment for electrical operation in the Bedford (Ind.) stone quarry district it was found unsatisfactory to locate meters in buildings at the stone mills on account of the vibration of cranes and heavy machinery. It was, therefore, decided to design special



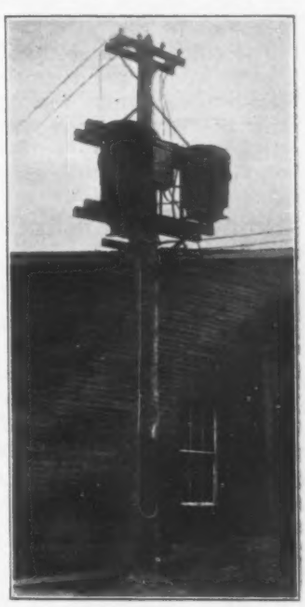


FIG. 1 AND 2—ARRANGEMENTS OF THREE TRANSFORMERS ON A POLE SHOWING CONNECTIONS TO CURRENT TRANSFORMERS AND METER

meter and transformer installations which would be weatherproof and suited to the conditions. The great number of installations to be made, and in many cases the large rating of transformers to be installed, necessitated a design which would standardize the parts for mounting, hoisting and connecting up the transformers and for housing the current transformers and meters.

The distribution circuits were operated at 4000 volts, using standard 2300-volt transformers star-connected on the high-tension side and delta-connected to produce 220 volts on the secondary side. The accompanying illustrations show the ultimate design for the mounting of three power transformers of sizes up to 50 kw. capacity each. The box for the current transformers and the case for the meter are all mounted on a single pole. The crossarms, braces and hangers for this installation were all made of a standard size, drilled and treated ready for mounting at the storeroom. All connections on the primary and secondary of the trans-

formers were made by means of Crosby clamps, to eliminate soldering, which proved a difficult and expensive operation where live cables were to be joined in the winter weather. Further, the use of clamps permitted rapid connecting and disconnecting in the case of replacement. Numerous tests showed that the conductivity of clamp-made joints under all conditions was equal to that of soldered joints.

The meters were placed in cast-iron cases, near the bottom of the pole, at a convenient height for reading and inspection. Each box contained testing blocks and jacks to enable rapid testing of the meters. The wires between the current transformers and the meters were carried in Greenfield conduits.

The average installation cost of a transformer bank, aside from the cost of three 50-kw. power transformers, current transformers, meters and pole, was $28. This amount covered the crossarms, braces, hauling and all labor in connection with making the installation. It has been found that the installation shown can be made at from one-third to one-half the cost of a standard two-pole installation using a platform for supporting the transformers. This type of transformer bank also overcomes the necessity of busses for closing the delta, since the delta connection is made by connecting the outside leads of the three transformers together, looping them around the outside of the transformer bank, as shown in Fig. 1.

The entire work of electrifying this stone-quarry district as well as the design and installation of the transformer installations was carried on under the supervision of Esterline & Angus, consulting engineers, Indianapolis, Ind.

Minimizing the Effect of Wireless Apparatus on an Electric Service System

Methods of minimizing the disturbing effect that wireless equipment and antennae may have on electric service lines were touched on by A. J. Wagner at a recent meeting of the Empire State Gas & Electric Association. One remedy mentioned was to insert air-core reactors, each consisting of a 6-in. coil of about 100 turns in the service circuits on the wireless user's side of the meter. This equipment, the speaker explained, will eliminate high inductive effects which result when wireless aerials and distribution lines are parallel and close together. Conditions may be still further improved by connecting a non-inductive resistance, such as a carbon rod, of about 20,000 ohms resistance across the service circuit inside the reactors and grounding the middle point.

Methods Used to Provide Coal for a Large Group of Steam Stations

The amount of coal purchased annually by the Commonwealth Edison Company of Chicago probably represents the largest amount purchased by any one central station company in this country. The coal for this company's use is purchased by the fuel department, under the direct supervision of John F. Gilchrist, vice-president. This department also purchases the coal required by the Public Service Company of Northern Illinois, the Illinois Maintenance Company, the Middle West Utilities Company's Illinois subsidiaries and other companies in Wisconsin, Michigan, Missouri and Kentucky. That the amount of coal purchased is considerable and is increasing may be realized when it is stated that twenty years ago the daily consumption was 52 tons, whereas to-day the daily consumption is about 5000 tons, or the equivalent of 120 carloads a day, representing an annual expenditure of more than $2,000,000.

The coal is obtained in the most part from Illinois and Indiana from what is known as the Eastern Interior Coal Basin, which also extends into western Kentucky. The major portion of this coal basin is situated in Illinois, comprising, in fact, about 35,600 square miles or about 65 per cent of the State of Illinois. The coal obtained from this region is bituminous coal, relatively high in ash, volatile matter, moisture and sulphur, and has a tendency to cause smoke. The coal received by the Commonwealth Edison Company is composed mostly of screenings that will pass through a 1¼-in. and a 2-in. screen, and all coal larger than this must be passed through a coal crusher before it can be burned. While the furnaces were designed to burn screenings, it is necessary during some portions of the year to purchase run-of-mine coal because of the increase in the cost of screenings. In such cases this coal must be crushed for satisfactory use.

The coal is purchased direct from the mine, about one-third being purchased in the open market, the remaining two-thirds being bought by contract. The cost, per ton, varies from 30 cents to 85 cents at the mine, with an additional charge of 82 cents and $1.05 per ton for hauling from the mine to the stations in Chicago. The lower freight charge is for hauls from Springfield, the latter from the Carterville district. Figuring the length of haulage as about 250 miles and the freight charge as 82 cents per ton, it is seen that this is equivalent to about four-tenths of 1 cent per ton-mile.

One item of particular interest in the purchase of coal by the Commonwealth Edison Company and the payment for freight charges, is that the weights are determined according to the scales belonging to the central station company. The weights as given by these scales determine the sums paid to the mine and to the railroad, both normally and at times of dispute. This practice the railroads did not at first approve, but finally consented, in view of the enormous amounts of coal handled.

The relatively high freight charges, to which must be added charges for demurrage where cars are held up due to strikes, etc., makes it important to keep very close and accurate records of the car movements. This is done from the moment a car leaves the mine, through the railroad switching yards, until the car is emptied and given over to the railroad company again. The actual time required to bring in the coal from the mine varies from about forty-eight hours to fourteen days, according to the weather conditions, cars available, freight conditions on the railroad, etc. To safeguard the stations against a shortage of coal a supply is kept on the ground at each station. About 250,000 tons of coal are stored in this way. The coal used for storage is lump and egg. Screenings are not suitable for storage in large quantities because of the likelihood of it catching fire due to spontaneous combustion after storage for periods of sixty days, and sometimes even less, in warm weather. To prevent fires developing in the coal piles thermometers are installed throughout the coal at frequent intervals, and these thermometers are read at definite periods. In this way the temperatures can be watched and coal that is heating can be moved before combustion takes place. It is necessary not infrequently to move coal for this reason, the work being done by steam shovels. In addition to the above coal pile, which would keep the stations going for about one and one-half months, there is always coal in cars on the station grounds sufficient to supply the furnaces for two days, and still more coal at the railroad companies' yards for a further three days, without considering the coal in the bunkers and that in transit.

MARKETING ELECTRICITY

A Department on Selling Service and Widening the Use of Electrical Energy

Cooking by Wire in Southern California

A Campaign by the Southern California Edison Sales Staff That Has Put 540 Ranges on the Company's Circuits in Recent Months

BY S. M. KENNEDY

General Agent Southern California Edison Company, Los Angeles, Cal.

On Nov. 1, 1915, the Southern California Edison Company commenced in earnest the selling of electric ranges to its consumers, and at that time there were approximately fifty electric ranges in use on the system. By the middle of May there had been installed or sold a total of 540 electric ranges additional to the first fifty. Each of these ranges is installed in a separate house, as no contracts have yet been made for putting electric ranges into apartment houses. However, arrangements are now being made to open up the field of apartment houses also, and the company hopes before very long to be able to report a considerable number of sales in that direction. The work is being taken up in earnest, and the company has organized a department which has set about the education of the southern California public in the broad subject of electric cooking. This department is in charge of an expert, and he and his assistants will work regularly and continuously along systematic lines.

Already the work of this department is bringing in sales at the rate of an average of twenty electric ranges per week, and it is confidently expected that this average will shortly be increased. The company expects to have in operation upon its lines at the end of the present year no less than 1000 electric ranges, although it is realized that these first 1000 ranges will be the hardest to obtain.

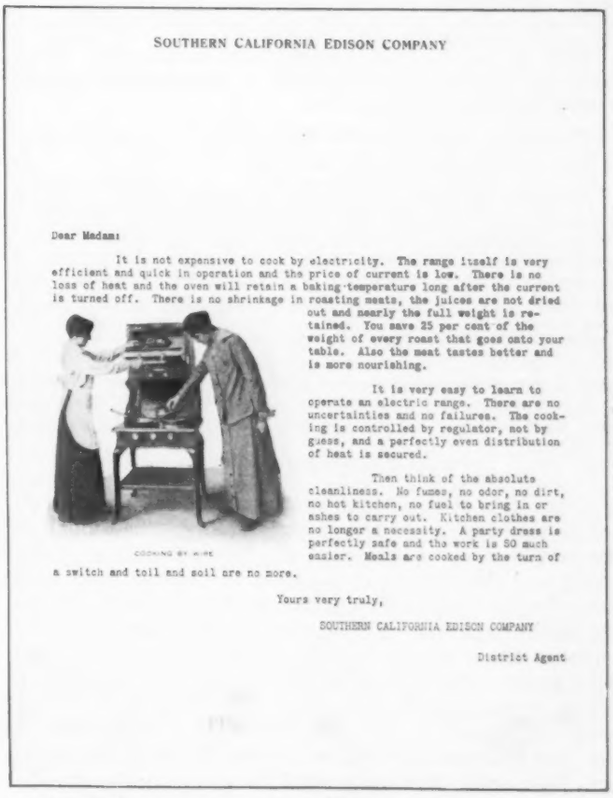
SALES AND ADVERTISING METHODS

The methods adopted by the electric range department for developing the business embrace follow-up letters, folders, newspaper advertising, and the work of electric range salesmen and women demonstrators. The company's territory is divided into a number of geographical districts, each district being operated as a unit under the management of the general offices. Electric range selling work has been started in one district at a time and directed to selected lists of consumers in the territory in each district not supplied with gas service. Two letters and a postal card are sent at intervals of one week to ten days, just prior to the opening up of the electric range campaign in each district. These letters have been of great use in breaking the ground and in interesting consumers in preparation for the personal visits of the electric range salesmen. The salesmen also find it of great advantage to leave carefully prepared folders or other printed matter after they have talked to a prospect. The information in the folders and printed matter is read over again when the head of the family returns from his daily labors, and in this manner conclusions are often reached which lead to business.

HOW THE HOT-WATER ISSUE IS MET

The company has been handling the products of three or four electric range manufacturers, and usually these manufacturers have sent special salesmen to assist our electric range salesmen in each district. This co-operative work between the manufacturer's salesmen and the company's salesmen has been eminently satisfactory, and, with the woman demonstrator holding daily demonstrations in the district office, the prospects have had plenty of opportunity to learn the story of "cooking by wire" and to see how easily and satisfactorily it may be done by means of an electric range.

The experience of the Southern California Edison



SOUTHERN CALIFORNIA EDISON COMPANY

Dear Madam:

It is not expensive to cook by electricity. The range itself is very efficient and quick in operation and the price of current is low. There is no loss of heat and the oven will retain a baking-temperature long after the current is turned off. There is no shrinkage in roasting meats, the juices are not dried out and nearly the full weight is retained. You save 25 per cent of the weight of every roast that goes onto your table. Also the meat tastes better and is more nourishing.

It is very easy to learn to operate an electric range. There are no uncertainties and no failures. The cooking is controlled by regulator, not by guess, and a perfectly even distribution of heat is secured.

Then think of the absolute cleanliness. No fumes, no odor, no dirt, no hot kitchen, no fuel to bring in or ashes to carry out. Kitchen clothes are no longer a necessity. A party dress is perfectly safe and the work is SO much easier. Meals are cooked by the turn of a switch and toil and soil are no more.

Yours very truly,

SOUTHERN CALIFORNIA EDISON COMPANY

District Agent

ONE OF THE LETTERS USED TO OPEN A LOCAL RANGE-SELLING CAMPAIGN IN THE SOUTHERN CALIFORNIA TERRITORY

Company in connection with the selling of electric ranges during the past five months has been remarkable in two respects. In the first place, the question of heating water after an electric range has been purchased has not been a serious obstacle in making installations, for the selling of ranges up to the present time has been almost entirely restricted to territory not supplied with gas. Prospective purchasers of electric ranges are advised to continue the present means they have for water heating when hot water is required in quantities, and only when small quantities are required to heat the water on the electric range. The salesmen always keep before the customers' minds, however, the fact that in the near future there will probably be an efficient and satisfactory electric water heater which may be used in conjunction with the electric range.

In the second place, the consumption of electric ranges installed by the company during the past few months has been greater than was estimated, but there have been very few complaints regarding the sizes of bills presented for service. Where complaints have been made investigation has usually discovered that the handling of the range has not been understood, and that after proper instructions have been given to the customer the consumption decreases and no further complaints are made.

Some Testimonial Letters

On the other hand, there is plenty of evidence coming in that the electric ranges sold and in use are giving great satisfaction. The following extracts from two spontaneous letters speak for themselves as to the consumer's attitude. The first letter is dated March 3, 1916, and is from a gentleman living in Whittier, Cal. It reads:

"Inclosed please find check for amount due for one electric range installed in my home several weeks ago. Apropos this stove, I wish to state that we have given it a complete demonstration and find that it is all you claim for it, and I believe the climax has been reached in an electric stove. It certainly has our hearty indorsement, and it is far ahead of anything for the kitchen in modern cookery. I should be pleased to have you refer anyone who is interested to me, as I think we are in a position to speak authoritatively regarding it."

The other letter is dated March 27, 1916, and is from a lady living near Anaheim, Cal.:

"I have now had my electric range in use for one month. I find that it can either be an 'expensive luxury' or an 'economical necessity.' It all depends upon the user. I have used all kinds of cooking heat but find electricity best. I never before have seen an oven in which such even heat can be obtained. I have found that I can start my meal about ten minutes earlier and have a meal far superior to any other stove. I have discovered for myself many points which are of great value from an economical standpoint. I find that I can cook nicer cookies and pastry than ever before, and for meats, there is no comparison to the old-fashioned way in which the life of the meat was allowed to pass off in vapor."

The Effect on the Load

From the central station's standpoint our electric range load has proved very satisfactory. The monthly consumption per range sold is quite equal to expectations, and the installations on which records have been kept clearly indicated that the electric range when installed in quantities will help the load factor as well as improve the diversity factor. And though there has been some anxiety expressed by central stations that a heavy range load would affect the daily and annual peaks disastrously, our experience has demonstrated that the cooking load will not seriously affect the peak, and that under ordinary conditions, owing to the diversity factor. not more than 10 per cent of the connected load in electric ranges is likely to come upon a peak at one time. Consequently there need not be the fear of increasing the capacity of the burners so that cooking may be done quickly and meet the competition or other fuels. There must be sufficient heating capacity in the burners to do the cooking as quickly as any other fuel which the consumer may have previously used, for customers will pay the bills for energy used in an electric range much more cheerfully if the work is done quickly as well as satisfactorily. They object to standing around waiting for the heat to come or waiting for the dish to be cooked slowly, when it could just as well be done speedily.

The Los Angeles Cooking Rate

We have adopted here a combination schedule for lighting and cooking which seems to be working out satisfactorily. For all consumption of electric energy in residences and suites of apartments, through one meter, where an electric range is installed and used for cooking purposes it figures:

Class A—Houses of eight active rooms and over, first 40 kw.-hr. per month 7 cents per kilowatt-hour.

Class B—Houses of six and seven active rooms, first 30 kw.-hr. per month 7 cents per kilowatt-hour.

Class C—Houses of five active rooms and less and apartment house suites first 20 kw.-hr. per month 7 cents per kilowatt-hour.

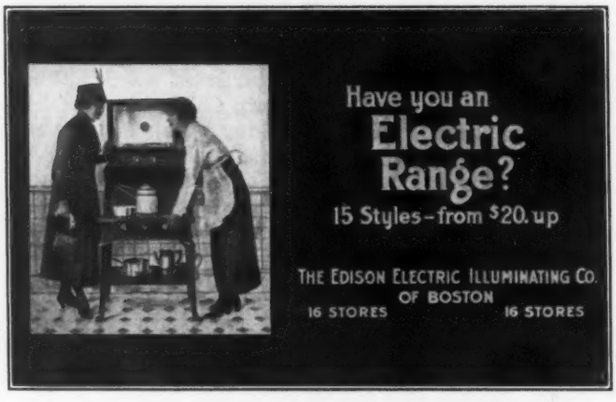
For all energy used in excess of the number of kilowatt-hours per month designated in any of the above classes 3½ cents per kilowatt-hour.

The monthly minimum bill is $2.50, and in classifying the houses supplied with service under this schedule bathrooms, halls and cellars are not included as active rooms.

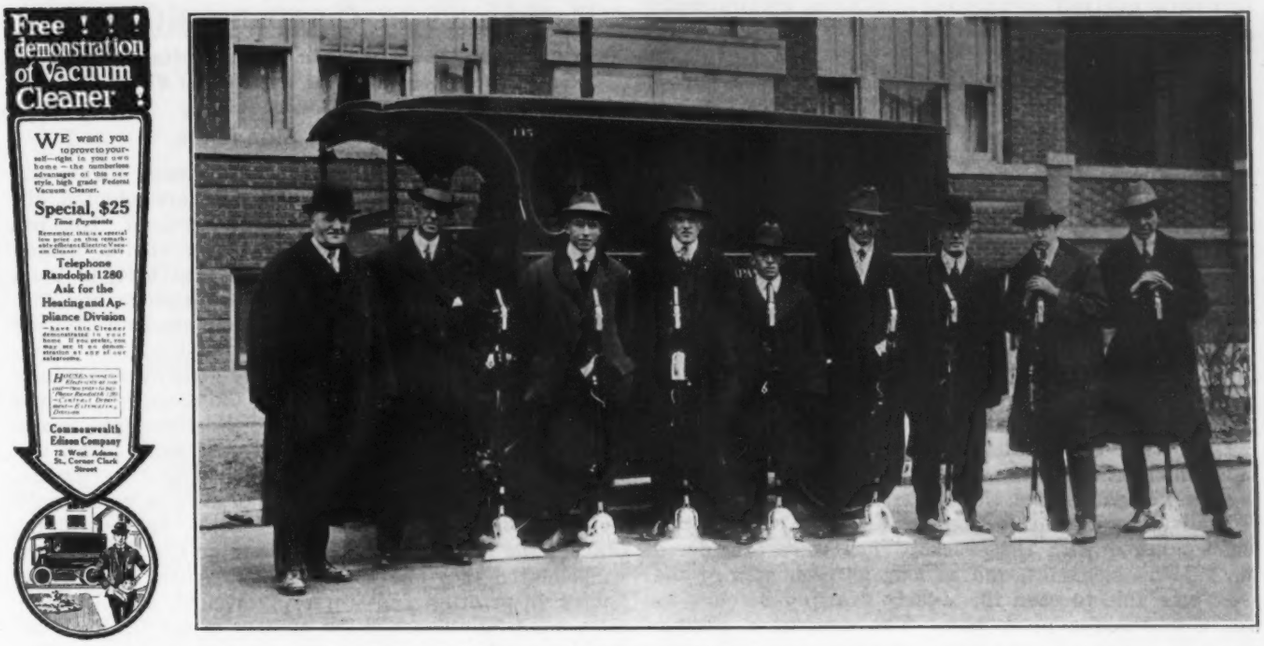
The Southern California Edison Company feels that the progress of cooking by wire and the installation of electric ranges will advance as rapidly as the public is properly informed regarding the advantages of electric cooking. Hence, every effort is being made to give our range campaign the widest possible publicity and make each installation an active co-worker in the cause.

Effective Electric Range Advertising

A striking street car advertisement done in black and white is a feature of the Boston Edison Company's electric range campaign. Carried on the standard card for rack service, approximately 11 in. by 21 in. in dimensions, the display shows an electric range demonstration in progress, and on account of its make-up and contrast effects has attracted a large number of inquiries to the main office and branch stores of the company throughout the 700 square miles of Boston Edison territory.



STREET-CAR CARD USED BY THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON



ONE OF THE EFFECTIVE ADVERTISEMENTS IN THE COMMONWEALTH EDISON VACUUM-CLEANER CAMPAIGN, AND THE SALES SQUAD WHICH WORKED FROM AN ELECTRIC TRUCK AS ITS BASE

A Vacuum-Cleaner Campaign That Boomed Store Sales

BY OLIVER R. HOGUE
Head Lighting Agent, Commonwealth Edison Company, Chicago

April ordinarily is the banner month for vacuum cleaner sales. But the Commonwealth Edison Company of Chicago has entirely reversed the order of things and throughout last winter doubled, trebled and almost quadrupled the highest high mark ever set in April. The official under whose direction the campaign was carried out tells here how the change was brought about.

When our 1915 summer appliance campaign closed we had a force of good salesmen on our hands, and it was considered good policy to continue them in the company's employ. We had tried the individual canvasser plan as a means of selling vacuum cleaners, but with indifferent success. So in casting about for a different method we decided to send the entire force of salesmen out in a group with an electric truck. An experienced salesman who had been a long time in the employ of the company was made captain of the crew, and it was his job to direct the efforts of each man, to route the individual members of the crew, to help the new and inexperienced salesmen get a start and, in general, to manage and supervise the details of the campaign.

The crew idea was considered to be better than the individual-man scheme, because loafers, if any, could thus be weeded out of a crew in two or three days, while with the other plan it is generally necessary to give each man at least two weeks to prove his worth. It was the company's aim in this campaign to cover the entire residential section of the city, excepting those exclusive homes in which salesmen probably could not secure an audience with the lady of the house. Apartment dwellers and moderately well-to-do home owners were considered the best prospects.

Although the men employed were all experienced salesmen, a factory man was called in before the campaign was started to give a demonstration before the group and to show how the cleaner was made. It was also decided in the beginning to adopt the "first-payment" plan rather than the ten-day free-trial plan, because women who have no intention of purchasing will accept a cleaner on ten days' free trial, clean the entire house with it and return it at the end of the trial period. When, however, the women are asked, as they were in this campaign, to pay $2.50, or 10 per cent of the purchase price, in cash, and the balance in eleven monthly installments with electric light bills, they regard the transaction as a concluded sale when part of the money is paid. There are no comebacks. Few women will pay $2.50 to have their homes cleaned once or twice. The company's arrangement with the salesmen was that they were to be paid on a commission basis, receiving $2.50 for each cleaner sold. Each man was given a drawing account of $12 a week.

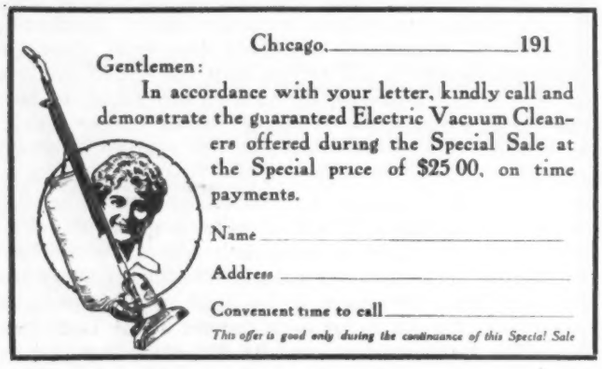
The keynote of the campaign was education. After gaining an entrance to each house the salesman asked permission to show what a cleaner will do, and offered to clean any rug or carpet in the house without charge or obligation. To make the demonstration effective he showed the interior of the bag before and after the demonstration. After that his selling argument began. When a salesman found the prospective customer not at home he left a postal card telling of the call and offering to come again and demonstrate the cleaner if the card was filled out and returned to the company. Very few of these cards were returned. On other occasions, when salesmen were unable to complete sales but believed the people on whom they had called to be prospects, letters were written from the office to follow up the salesmen's efforts, and a return card was inclosed. About 5 per cent of these cards were returned, and in no case did the salesmen who followed up such requests fail to effect a sale. The difference between the success with the latter type of cards and those mentioned before can be definitely attributed to the fact that the recipient of the latter type had in each case been educated to the advantages of the electric vacuum cleaner, whereas those who received the former cards were persons who had not seen a demonstration.

MONTHLY RECORD OF VACUUM CLEANERS SOLD BEFORE AND DURING CAMPAIGN

Date	Heating and Appliance Salesmen	Michigan Ave. Electric Shop	*Clark St. Electric Shop	Total
January, 1915	5	91	..	96
February, 1915	11	56	..	67
March, 1915	32	..	..	32
April, 1915	43	102	..	145
May, 1915	58	81	..	139
June, 1915	26	57	..	83
July, 1915	25	38	..	63
August, 1915	16	42	..	58
September, 1915	26	47	19	92
October, 1915	73	80	189	342
November, 1915	77	110	281	468
December, 1915	71	119	384	574
January, 1916	45	34	61	140
February, 1916	67	36	70	173
March, 1916	119	81	129	329
Total				2,801

*Opened in September, 1915.

To support these selling men, newspaper advertising in English and foreign language papers appeared at regular intervals. But the big results of the campaign did not come from the direct sales made by the crew which worked with the truck. They were considered the field missionaries, and as long as each man of the crew was able to earn his weekly drawing account he was considered a good man. The company's electric shops, however, were the places which cashed in heavily on the field salesmen's efforts, and a glance at the tabulated results of the campaign is interesting. Whereas the company's few field salesmen before the campaign started were only able to sell an average of about twenty-five cleaners a month, after the intensified effort started in October this average was increased to


Chicago,_____191
Gentlemen:
In accordance with your letter, kindly call and demonstrate the guaranteed Electric Vacuum Cleaners offered during the Special Sale at the Special price of $25 00, on time payments.
Name_____
Address_____
Convenient time to call_____
This offer is good only during the continuance of this Special Sale

A FOLLOW-UP CARD USED BY THE COMMONWEALTH EDISON COMPANY THAT INVARIABLY PRODUCED SALES

about seventy-five cleaners a month with ten men at work. Similarly, before the campaign started the Michigan Avenue Electric Shop, the only downtown store then operating, was selling fifty or sixty cleaners a month, but after Oct. 1 the total sales of the two downtown stores jumped to 260, 390 and 500 cleaners a month.

This success in store sales can be accounted for. A woman can be convinced of the advantages accruing to the owner of a vacuum cleaner but her instinct is to "shop." Consequently, after a salesman has made his demonstration and has virtually sold the cleaner, she will visit the electric shop to look over all makes, and before she leaves will order a cleaner of some type, paying for it on the same time-payment plan offered by the salesman. So the real value of an effort such as this cannot be judged entirely from the direct results produced by the campaign crew. All sales must be taken into consideration, and were the whole truth known it is probable that every store in Chicago selling electrical appliances profited directly by the educational influence of this campaign.

Economies in Company Stationery

How the Pacific Power & Light Company Has Reduced the Number of Its Report Forms, the Time of Filling Them in, and the Cost of Printing

BY LEWIS A. MCARTHUR

By rigid scrutiny of existing stationery forms and careful consideration before new ones are adopted, the Pacific Power & Light Company of Portland, Ore., has been able to reduce the total number of its printed forms from 450 to 375. The work has been in hand during a period of two years, but eliminations and consolidations have been made only as old stocks were used up. When new supplies were ordered by the storekeepers, the forms in question were gone over carefully for the purpose of eliminating all unnecessary features of the company's form system. For example, many statistical statements and other forms were found undesirable and of little practical value to the officials. Frequently, moreover, features that were of value could be consolidated with some other form. In several instances the desirable points of four or five forms were consolidated into one form. This resulted in a great saving in printing and stores investment, and, in addition, materially lessened the number of entries in stores ledgers where stationery forms are kept in stock. Furthermore, an operating saving was made in eliminating the work of filling out the form and filing it after it has been used.

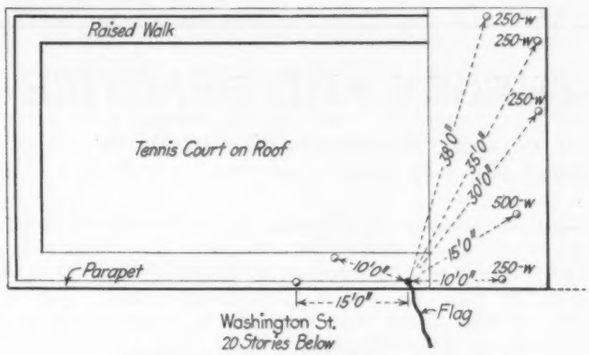
Elimination and consolidation were not the only economies effected. Many of the older forms were found to be of sizes that cut wastefully from paper stock, and others were in size quite unsuited to their work. Other forms were on paper too expensive for the service. As far as possible, economical standard sizes were adopted, depending on the dimensions of the printer's stock, size of filing space, or some other governing feature.

On investigation, it was found that many of the forms most frequently used were wasted when simply padded, and hence thereafter these were printed with small margins, and stapled at the top with cheap tagboard covers on each bunch of 50 or 100 sheets. This produced a great saving of time in handling forms in stores and shipping them to branch offices, and in addition it rendered negligible the loss from pads breaking up and sheets getting dirty, either in the store room, in transit or in use.

During the two years mentioned a number of new forms have been adopted, so that the actual reduction has been in excess of the seventy-five forms above noted. The company prints its complete stationery list of standard forms every few months in its company bulletin.

Brooklyn Edison Company Wins 800 New Houses Under Impulse of "Wire-Your-Home" Campaign

More than 800 homes were wired in the borough of Brooklyn, New York City, during "Wire-Your-Home" month, 400 contracts being taken by the Edison Electric Illuminating Company and about an equal number by the electrical contractors. This is about eight times the normal monthly grist of business, and the increase is directly attributed to the added impulse of the campaign. The average contract figured at approximately $100, and the Edison company financed more than $40,000 of this business. A very systematic and thorough selling campaign, which covered all sections of the city, was made.



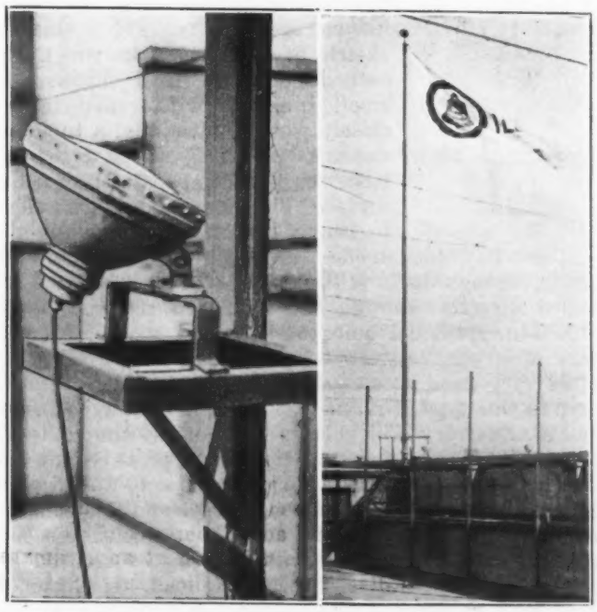
ARRANGEMENT OF PROJECTORS ON ROOF

Flood Lighting a 30-Ft. Silk Flag on a Twenty-Story Building

When a lighting salesman from the Commonwealth Edison Company approached an official of the Chicago Telephone Company to sell an electric flag sign that official refused to accept the proposition. "What I want," said he, "is to light the big silk flag on the top of our twenty-story building. During the day we fly the pennant of the Chicago Telephone Company, but at night I would like to see 'Old Glory' on that 50-ft. flagstaff illuminated."

Consequently a new 30-ft. by 15.5-ft. silk flag and six flood-lighting projectors were purchased and mounted on portable supports. In four of the projectors 250-watt stereopticon lamps were used, and in the two others 500-watt lamps were employed. The projectors were first mounted on portable bases so that by experiment it could be determined where they would produce the best results. The position of the flagpole at the edge of the roof and the fact that the flag changed its position with the wind added difficulties to the problem.

As the installation stands it is not always necessary to use all of the units to light the flag. To effect operating economy and to make sure that the flag is properly lighted, one man is detailed to adjust the projectors each evening and to light those units which are needed. The two 500-watt units are directed at the blue star field of the flag at all times because the dark color of this portion makes it most difficult to illuminate. The minimum number of lamps ordinarily used on the flag is four.



ONE OF THE PROJECTOR LAMPS, AND THE ROW OF REFLECTORS ALONG PARAPET NEAR FLAG POLE

The first cost of this installation, including projectors at $106, wiring at $50, and the projector supports at about $1.50 each, was about $165, exclusive of labor. Most of the installation work was done by the telephone company's own engineering and construction department. The portable-lamp supports, which consist of 0.25-in. by 1.5-in. strap iron and 24-in. by 24-in. oak bases, were also made by the company's men. Under Chicago conditions it is necessary to wash the flag about once every two weeks at a cost of approximately fifty cents.

Electrics in a California Tour—Thirty-Four Cars Make 70-Mile Round-trip Run

An interesting demonstration of the touring capacity of the electric vehicle was given in Los Angeles, Cal., last month, when thirty-five Beardsley electric vehicles assembled for a run to Long Beach and return. The

A FEW OF THE THIRTY-FIVE ELECTRICS WHICH MADE THE 70-MILE LOS ANGELES-LONG BEACH ROUND-TRIP RUN

cars were driven by their owners and carried as passengers more than 100 guests. Each car averaged over 70 miles on the trip, and not a single mishap occurred. The return trip of 35 miles was made in two hours, and every car came home under its own power. The fact that all these vehicles were driven by their owners, several of whom can boast of more than fourscore years, and two-thirds of whom were women, is striking evidence of the practical utility of the electric vehicle. This run was made by what is said to have been the largest gathering of one make of electric vehicles ever assembled for a tour.

Taking on West Virginia Coal Mines as Central Station Customers

New contracts made by the Virginian Power Company, Charleston, W. Va., of which H. G. Scott is general manager, with coal mines not yet connected to the company's lines, will increase its coal consumption from about 80,000 tons per annum to about 125,000 tons per annum. The company has just begun a comprehensive campaign of education in the form of paid advertisements in the leading Charleston newspaper to encourage the establishment of new industries in its territory and to promote harmonious relations between itself and the public. The services of a professional journalist have been engaged for this purpose.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

German Electricity Supply and Rates

Proposed Government Supervision Concerning Desirability of Uniform Supply Throughout the Nation—The New Rates of the Municipal Electricity Works of Berlin

IN *Elek. Zeit.* of March 2, 1916, Fr. Schmidt refers to a German government manifesto issued before the war on the desirability of uniformity of electricity supply throughout Germany in such a way that not only the rich and highly populated districts would be supplied with electric service, but also the poorer and the less populated agricultural districts. While the author of the article agrees with this general tendency, he would deplore any restrictive regulations of the government since these would only discourage private enterprise to go into unremunerative transmission schemes in agricultural districts. If private parties undertake such pioneer work, they ought to have something of a monopoly in carrying out the installation. The author thinks that in the end it should not be the state which should take over the electricity supply, but expresses his belief that each province should do so, installing one or more large generating plants and a transmission system extending over the province. The distribution to the consumers should, he thinks, be in the hands of the counties or municipalities, and the electricity supply systems of the different provinces should be inter-connected.

In *Elek. Zeit.* of March 9, 1916, there is an interesting review of the new selling rates for electricity which have been put in force by the Berlin Electricity Works on April 1, 1916, and a comparison with the former rates.

The general rate for lighting was formerly 10 cents per kilowatt-hour, and to large consumers a discount was allowed at the end of the year according to the consumption during the year; this necessitated a great deal of calculations and repayments at the end of the year. To avoid this, the following sliding scale has been introduced for lighting. The first 15,000 kw.-hr. in a year are charged at 10 cents per kilowatt-hour, the next 15,000 kw.-hr. at 8.75, and any excess at 7.5 cents. If a consumer has several installations at some distance from each other, the consumption in all of these is lumped together and taken as a unit.

The special rate for hours of low load at the central station was formerly 4 cents per kilowatt-hour for the night hours only after 10 p. m. This same rate has now been extended for all hours between 10 p. m. and 4 p. m. the next day. This rate is allowed only to consumers who guarantee to use at least $125 worth of energy during these low-rate hours.

For small installations up to 200 watts rating the consumer can choose to pay a flat rate, but must do so for at least a year, according to the following table:

Rating	60 watts	80 watts	100 watts	140 watts	200 watts
Yearly flat rate....	$6.30	$8.40	$10.50	$14.70	$21.00

This rate is payable in four quarterly installments, one-third of the rate on Oct. 1 and Jan. 1, one-sixth on April 1 and July 1. The condition is made that the watts demand agreed upon will not be used for more than 1600 hours in the year and the electricity works have the right to install control apparatus. For any consumption above this number of hours 4 cents is charged per kilowatt-hour.

For power purposes and commercial uses the minimum consumption during the year is fixed at 300 kw.-hr. at $12 (instead of 400 kw.-hr. at $16, which was the former minimum limit).

For residences and workshops a rate of 4 cents per kilowatt-hour may be selected irrespective of the use to which the electric current is to be put, but in this case an extra lighting charge is made of 0.75 cent per month for each square meter of the total area of the residence of workshop (7 cents per 100 sq. ft.).

Special inducements are made to facilitate wiring, for instance, in form of loans for the wiring installation to be paid back in installments. To owners of older houses (not new buildings) who have not yet electric light and have the house wired, the inducement is made that a certain amount of energy (depending on the size of house) will be supplied free for the first year, provided no prepayment gas meters are in the house.

Generators, Motors and Transformers

Hot Cathode Argon Gas-Filled Rectifier.—G. STANLEY MEIKLE.—A contribution from the research laboratory of the General Electric Company. The kenotron, in its present commercial form, is made to supply currents as high as 250 milliamperes, at voltages up to 100,000. However, owing to the fact that the voltage drop in the kenotron when rectifying currents of the above order of magnitude is relatively high (100-500 volts), it is impracticable to use this device on low-voltage circuits. Fig. 1 shows a sketch of a rectifier in which the cathode consists of a filament of small tungsten wire coiled into a closely wound spiral, and a tungsten anode of relatively large cross-section, with a comparatively smooth surface. The filament ends are welded to heavy tungsten wires, while the anode lead is swaged from the anode, though it is still a part of it. All leads are sealed directly through the high heat-resisting glass into 3-in. spherical bulbs of a similar glass. A pressure of argon between 3 and 8 cm. (measured cold) gives very good results and is, therefore, the pressure used in this type of rectifier. The half-wave type shown in Fig. 1 is very desirable, because of the simplicity of its construction and installation. A typical circuit for this half-wave rectifier, consisting of a 40-watt transformer for filament excitation, a load and a means of regulation, is shown in Fig. 2. Where efficiency is not a serious consideration, regulation can be secured by placing resistance in series with the load. If efficiency must be considered, however, the line voltage is transformed to values where no regulation is required, so that the load can be placed directly between the ter-

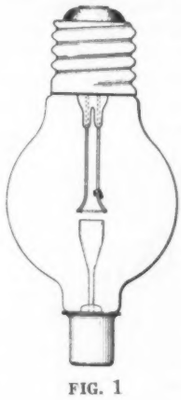
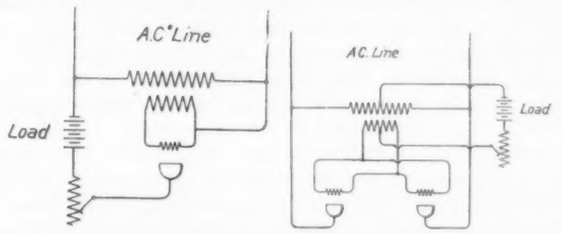


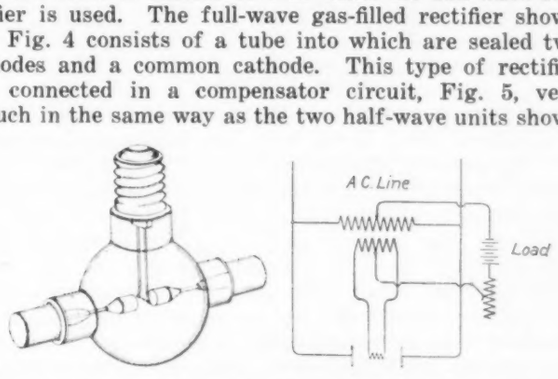
FIG. 1

minals of the transformed source. Unless a sufficiently great number of these units controlling relatively large amounts of energy are placed in a power circuit in such a way as to badly distort its wave shape, the use of this type of tube is permissible. As a matter of fact, the half-wave unit of low-current capacity if generally installed will have no appreciable effect upon the power supplying circuit. Should this feature, however, become objectionable to the central station when high-current units are used, two half-wave rectifiers can be placed in circuit, as shown in Fig. 3. The compensator



FIGS. 2 AND 3—METHODS OF CONNECTING SINGLE AND TWO HALF-WAVE GAS-FILLED RECTIFIERS FOR SERVICE

is designed to transform the voltage to values required for regulation, and to supply current for exciting the filament. It possesses as much or as little reactance as the characteristics of the load require for proper operation. Where it is possible to split the load into equal parts, or where the total load is divided into units as, for example, the vehicle battery of a central charging station, the half-wave units, each with its individual battery load, are connected into the circuit in such a way that half of the tubes are rectifying one loop of the wave, while the other half rectify the remaining loop. The resultant effect upon the wave shape of the main circuit is similar to that when the full-wave rectifier is used. The full-wave gas-filled rectifier shown in Fig. 4 consists of a tube into which are sealed two anodes and a common cathode. This type of rectifier is connected in a compensator circuit, Fig. 5, very much in the same way as the two half-wave units shown



FIGS. 4 AND 5—FULL-WAVE GAS-FILLED RECTIFIER AND METHOD OF CONNECTING FOR SERVICE

in Fig. 3. Oscillograms showing the behavior of the rectifier are given.—*Gen Elec. Review*, April, 1916.

Distribution of Magnetic Flux in Commutating Zone of Direct-Current Machines.—CL. SHENFER.—The author, on the basis of a series of oscillograms, arrives at the conclusion that the magnetic lines of force of a commutating pole pass through the iron of the armature core and not across the teeth and slots, avoiding the iron of the armature core, which latter theory is the one accepted by several authors.—London *Electrician*, April 7, 1916.

Polyphase Commutator Motor.—H. KAFKA.—A long mathematical article developing the circular diagram for the polyphase shunt commutator motor.—*Elek. u. Masch.* (Vienna), Jan. 23 and 30, 1916.

Rotary Converter.—A note on a recent British patent (4401, 1915) of M. Walker for a rotary converter, the virtual position of the poles of which can be moved in respect to the brush position by changing the polarity of portions of the poles and by a commutating pole excited from a double brush.—London *Elec. Eng'ing*, April 13, 1916.

Electric Diagrams.—P. RAYNER-SMITH.—With reference to G. Kapp's proposed system of uniformity in drawing electrical diagrams recently abstracted in the Digest, the author calls attention to the new series of electrical symbols prepared this year by the U. S. Patent Office as a chart for draughtsmen. These symbols are compared with Kapp's symbols and critically discussed.—London *Electrician*, April 21, 1916.

Lamps and Lighting

Inclosed Cadmium-Vapor Arc Lamp.—HENRY J. S. SAND.—An abstract of a (British) Physical Society paper on an inclosed cadmium-vapor arc lamp which is shown in Fig. 6. It consists of a quartz tube bent into an inverted U in such a manner as to give rise to a short cathode chamber, *A*, and a long anode chamber, *B*. Each of these chambers is continued in a leg consisting of a thick-walled capillary through which a tungsten wire passes, lead seals, *s*, *s*, being fitted at the ends of the legs. The method of filling the lamp is described. It is started by heating with a Bunsen burner from the top until the metal is well molten. When started from the cold it usually lights up even before tilting; it is usually run on a lighting circuit of 100 or 200 volts with a resistance adjusted to take a current of 5 amp. to 7 amp. on short-circuit. The voltage on the terminals of the lamp is low, usually about 30.—London *Electrician*, April 14, 1916.

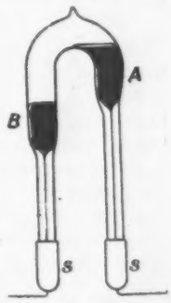


FIG. 6

Traction

Leakage of Current from Electric Railways.—BURTON MCCOLLUM and K. H. LOGAN.—A paper in which the authors discuss the factors which influence the escape of current from street railway tracks and indicate the importance of each factor as a possible cause of electrolysis of gas in water pipes. Some of the extended conclusions of the authors are as follows: The voltage and current conditions in the return circuit are characterized by three constants, namely, the resistance of the track per unit length, the leakage resistance between track and ground per unit length, and the feeding distance. The effect of track resistance on leakage currents is exactly the inverse of leakage resistance; hence an increase in leakage resistance in any given ratio leakage currents in the same degree as increasing the conductance of the tracks in the same ratio. This emphasizes the importance from an electrolysis standpoint of so constructing the roadbed as to give the highest practicable leakage resistance. The leakage current from any given line increases much faster than the length of the line. This shows the importance of reducing feeding distances as much as practicable. Where the bus is not grounded there will be distinct positive and negative areas and the relative extent of the positive and negative areas is not a constant but varies with the length of the line, the track resistance, and the leakage resistance. For short track lengths the percentage of the total current which leaks from the tracks increases practically as the square of the feeding distance. For long feeding distances the rate of change of leakage current with distance is much less than for short feeding distances. The maximum leakage current increases less rapidly than the track resistance, except where the track resistance is

very low. If the leakage resistance is small, such as that corresponding to an average concrete roadbed or track embedded in damp soil, the leakage current decreases very rapidly with increase in leakage resistance. For high values of leakage resistance, however, the effect of increasing the leakage resistance on the total leakage current is much less. If the bus be grounded as by connecting it to the buried pipe systems the total leakage current is greatly increased. With grounded bus the rate of increase in leakage current becomes relatively small as the power house is approached and becomes zero at the negative bus. Where conditions are relatively good, increase in leakage resistance has a greater effect in reducing leakage currents if the bus is grounded than when it is ungrounded. When the conditions are such as to give rise to only moderate leakage currents, the maximum leakage may be more than doubled by grounding the negative bus. Where leakage conditions are bad the ratio of increase in leakage current due to grounding is less but the increase is still quite marked. These facts emphasize the importance of insulating the negative bus. If the bus be grounded, the maximum leakage increases more rapidly than the feeding distance. For ordinary values of track resistance and leakage resistance this is particularly true for feeding distances up to about 15,000 ft. or 16,000 ft. For very long feeding distances such as are frequently encountered on interurban lines, practically all of the current may return by way of the earth. Potential gradients in the tracks may be materially reduced due to leakage currents, and this reduction is more marked if the bus is grounded. Low potential gradients are not in themselves, therefore, a definite indication of good electrolysis conditions, but on the contrary may be due to excessive leakage of current from the tracks. Other factors must be considered, therefore, in interpreting gradient measurements. Low over-all potentials like low potential gradients, are not a positive indication of good electrolysis conditions. It is necessary to know the cause of the low values before their significance can be determined. Although high leakage resistance lowers the leakage current, it also increases the potential difference between tracks and earth. High potential differences are not in themselves, therefore, a definite indication of leakage current. As the track resistance or feeding distance increases indefinitely, the potential difference between tracks and ground at power house becomes indefinitely large, and the area of the positive zone becomes indefinitely small. Thus, with high track resistance or long feeding distances there will be very severe trouble in a relatively small area. High track resistance and low leakage resistance both tend to reduce the size of the positive area, although tending to increase the total amount of leakage current, and hence they greatly increase the severity of the electrolysis trouble near the power house. A relatively small positive area, therefore, is an indication of bad electrolysis conditions generally. The length of the positive zone varies from a maximum of 42 per cent of the feeding distance under ideal electrolysis conditions to an indefinitely small value where electrolysis conditions are particularly bad.—*Technologic Papers, Bureau of Standards*, No. 63, March 14, 1916.

Electrophysics and Magnetism

Influence of Crystals in Pure Iron on Electric and Magnetic Properties.—F. C. Thompson.—Experiments were made with specially pure Swedish bar iron. By heat treatment the number of crystals per centimeter could be varied from 690 in the quenched and tempered sample to about 10 in the drastically annealed one. Measurements of the electric resistance show that in every case an increase in the crystal size is accompanied by a corresponding decrease of the specific resistance. On the other hand, magnetic tests indicate that the maximum induction for a field of 95 gauss and the remnant magnetism are both, to all intents and purposes, independent of the size of the constituent crystals. —*Philos. Mag.*, April, 1916.

Units, Measurements and Instruments

Flicker Photometer.—H. E. Ives and E. F. Kingsbury. —A second long paper on the theory of the flicker photometer. In the present paper unsymmetrical conditions are discussed, and several new experimental results on the phenomena of frequency of the disappearance of flicker are given. The high sensibility of the flicker photometer is shown to be due to the very rapid increase in the critical frequency of disappearance of flicker on each side of the equality setting. In a flicker photometer which exposes the compared colors for unequal periods, the less exposed color will be under-rated. This form of flicker photometer is less sensitive than the ordinary equal-exposure arrangement. Mechanical imperfections in the flicker-photometer field are shown to shift seriously the equality point even with no color difference, emphasizing the necessity for strictly substitution methods in flicker photometry. The behavior of the visual apparatus toward intermittent light is closely parallel to the action of a layer of matter obeying the Fourier conduction law, in which the diffusivity varies as the logarithm of the intensity of the illumination, this layer being exposed to the intermittent light on one side, while its condition on the other side is measured by an instrument whose sensibility is governed by the Weber-Fechner law. The authors show that a theory can be given which predicts with great accuracy all the known experimental facts in connection with the flicker photometer.—*Philos. Mag.*, April, 1916.

Book Reviews

Essentials of Electrical Engineering. By John Fay Wilson. New York: D. Van Nostrand Company. 332 pages. 282 illustrations. Price, $2.50.

This work is strictly a student text-book. It deals with fundamentals, first of electric circuits and then of machines. The author emphasizes the fact that the principles and laws which relate to the flow of continuous current also govern the flow of alternating current. The fundamental laws of the electric circuit are, therefore, fully developed before any study of machines is attempted. Although little data or reference information on the performance of machines are given, the discussion of the principles on which their operation is based is presented from a most practical viewpoint and in sufficient detail to give the student an insight into the problems of electrical machine design, construction and operation. It should be an excellent text-book for classroom work or a reference text-book for a lecture course, being based upon the experience of the author in classroom instruction.

Pole and Tower Lines for Electric Power Transmission. By R. D. Coombs. New York: McGraw-Hill Book Company, Inc. 272 pages, 163 illustrations. Price, $2.50.

Since the advent of long-distance, high-tension transmission of electrical energy, there have been very few worthy publications brought out (other than the proceedings of the A. I. E. E.) that have kept pace with the rapid advancement in this branch of engineering, particularly in connection with the design and construction of the transmission line itself. However, the book

on "Pole and Tower Lines for Electric Power Transmission," just issued, which has been written from the standpoint of American practice, is an exception to this statement. The subject-matter of the volume, covering some fourteen chapters, is creditably arranged under proper headings, the discussions are interesting, the illustrations are well selected, and the data are compiled in a clear, concise and readable manner. As the author states, his object is more to give the reader a clearer perception of the application of the laws of mechanics as applied to the case in hand than to deal with purely electrical problems. The design of the supporting structures or towers, along with construction methods and various materials employed in connection with many of the American transmission lines, are described at some length, and the many tables and computations incorporated in these chapters are valuable and interesting. The chapters devoted to wooden poles, concrete poles, steel poles and towers, and special structures deal with most of the approved methods of present-day construction along these lines. In connection with the use of wooden poles, various methods of impregnation or preservative treatment are described, and the relative values of the pressure, open-tank and brush treatments discussed. Foundation work receives due consideration, the chapter devoted to this subject being replete with illustrations showing the most approved practice in this connection. The chapter on erection and costs, and on general specifications, is also creditable. The relative values given for suspension and pin-type insulators are interesting from an operating as well as from an engineering viewpoint.

Readers' Views and Comments

"Movie Engineering"—The Selection of the Most Efficient Screen Surface

To the Editor of ELECTRICAL WORLD:

SIR: The writer has read with considerable interest the editorial in your issue of April 22 concerning "Movie Engineering." The points brought out are certainly important and give some idea of the large field there exists for engineering work along this line. The question of the proper projection screen for use in a photo-play house is, as stated, of the greatest importance, and while in general the article is correct, yet it seems that the author has drawn some erroneous conclusions.

The three prime requisites for a photo-play projection screen are: (1) the furnishing of a bright, attractive picture to the audience; (2) the elimination of eyestrain on the part of the spectator to as great an extent as possible, and (3) the highest efficiency of reflection of the screen.

From a general consideration of the subject, and from tests which the writer has carried on at some length, it has been found that the brightness of picture is one of the features of most importance. The screen picture must be attractive and bright to the audience, and, to get full value of all seats in the house this must be true when the screen is viewed from any seat, whatever its location. This means that in a broad house a screen must be used which has a distribution curve such that, from whatever angle the screen is viewed, the brightness is approximately constant; on the other hand, in a narrow house it is only necessary that this brightness of picture subtend a small angle on account of the narrow width of the seating space.

If now in this narrow house the same screen is used as in the broad house above, a large amount of light will simply be thrown from the screen onto the side walls of the auditorium, which is far from desirable, as it raises the illumination in the auditorium, and by so doing actually makes the screen picture look less bright by contrast. However, if a so-called "focusing" screen is used, then similar conditions will exist for the narrow house as exist for the broad house—that is, an equally bright picture from all seats and very little side wall illumination.

Considering the second point, namely, the elimination of eyestrain to as great an extent as possible without interfering too much with the brightness of the picture, it has been found from numerous experiments and tests that the eyestrain resulting from a given bright surface or spot depends not only upon the intrinsic brilliancy or brightness of the surface or spot in question, but also upon the solid angle subtended by the picture on the screen as viewed by the spectator. The greater this angle the greater the eyestrain—in other words, those spectators who are seated near the front of the auditorium, down near the brightly lighted screen, will be subject to more eyestrain than those seated some distance from the screen. If it is desired to keep the eyestrain to a low value in all parts of the house, it is necessary to lower the brilliancy or brightness of the screen to the eye of the spectator sitting close to the screen, while maintaining a higher degree of brightness to the eye of the person sitting farther away. In the case of a matt-surface screen, such as the author speaks of in his article, this is not the case, the screen appearing practically as bright when looked at by the spectator well in front as it appears to the spectator in the rear of the house. On the other hand, a so-called "focusing" screen, such as the author speaks of as the "aluminum" type, if properly installed will give to the spectator sitting well in front a picture less bright than it gives to a spectator well back in the house. That is to say, if a house is narrow enough to permit of the use of a focusing screen, then a more nearly correct distribution of light can usually be procured than if a "matt" or diffusing screen is used.

The third point, namely, the efficiency, is one of great importance to the exhibitor, due to the fact that this will determine the amount of current he will have to use to obtain a satisfactory picture; in other words, the efficiency of his screen is a "dollars and cents" question in his daily expense. The greatest difference between the diffusing screen and the focusing screen is this point of efficiency. Of course, we must grant at the beginning that it is impossible to use a focusing screen in a wide house. In other words, such houses can only be satisfactorily lighted by means of the diffusing or matt surface screens. In a narrow house, however, the matt screen, on account of its distribution of the light, throws a large percentage of the total light on the side walls and only a small percentage of the total light is reflected directly back to that portion of the auditorium in which the audience is seated. Hence, the efficiency of such a screen so installed is very low, indeed, and the amount of light thrown on the screen must be very high in order to give a bright picture to the audience. If now, in this same narrow house, a proper focusing screen be installed, a very large percentage of the light will be thrown back to the eyes of the audience and only a comparatively small percentage will be thrown on the side walls of the auditorium, giving a comparatively high efficiency and requiring a greatly reduced consumption of current for the same brightness of picture than is the case with the diffusing screen.

The point brought out in the editorial of a focusing screen appearing brighter in one particular spot is certainly to be considered, and it is true that such a condition exists in some makes of focusing screens, due to their distribution of light.

In regard to cleaning and renewal of reflecting surface, it is true that the matt surface screen is generally more easy to clean or care for than the majority of the focusing screens. However, there are focusing screens on the market that show no depreciation after a long period of use, and that are kept at the highest point of efficiency by washing from time to time with ordinary soap and water.

It is hoped that these remarks will not be taken in any way except that of a desire to bring out certain points not mentioned in the editorial, and to urge on the present tendency of scientific research in the field of photo-play projection.

L. W. MCOMBER,
Vaughn, Meyer & Sweet.
Milwaukee, Wis.

W. H. THOMSON, JR.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

William H. Thomson, Jr., who has been appointed general manager of the Kansas City (Mo.) Light & Power Company, for the last five years has been general manager of the Des Moines (Ia.) Electric Company. Mr. Thomson was graduated from Cornell University in 1898 and for four years after leaving Cornell he served as assistant to the general manager of the St. Paul (Minn.) Gas Light Company. Afterward he held the position of general manager of the Union Light, Heat & Power Company of Fargo, N. D., and was promoted from that position to be assistant general manager of the San Antonio (Tex.) Gas, Electric & Traction Company. Later Mr. Thomson acted as general manager of the Corsicana (Tex.) Gas, Electric & Traction Company, and in 1911 he occupied the position of chief operating engineer of the Illinois Traction System, from which position he went to Des Moines.

W. L. Miller, formerly with the Northern States Power Company, has been appointed general manager of the Interstate Power Company, with headquarters at Galena, Ill., while F. H. Rickeman becomes sales manager.

Addis M. Whitney has resigned as vice-president of the Gas & Electric Improvement Company of Boston. Mr. Whitney was one of the pioneers in the founding and building up of the organization, and retires to look after private interests. He also severs his official connection with the Massachusetts Lighting Company, the Light, Heat & Power Corporation, the Daytona (Fla.) Public Service Company and the new Smyrna Public Service Company.

F. L. Gilman, who has been assistant general superintendent of the Western Electric Company, has been transferred to the engineering department with the title of assistant chief engineer, on account of the illness and absence of F. B. Jewett. Mr. Gilman has been identified with telephone interests for twenty-one years. He was graduated from Harvard in 1895, and after experience with the New England Telephone Company at Boston he took up switchboard engineering at New York City in 1901. In 1906 he was placed in charge of manufacturing for the company in New York City and was later made superintendent. In 1911 he was appointed general manager of the Kansas City telephone company, later becoming general manager of the Bell Company of Missouri.

A. C. Westphal has been appointed manager of the Mandan (N. D.) Electric Company, succeeding B. K. Skeels.

Dr. W. C. Huntington, formerly in charge of the Chicago office of the Bureau of Foreign and Domestic Commerce, has been appointed commercial attaché at Petrograd, Russia. He will succeed Henry B. Baker, who has resigned to re-enter the consular service.

Stanley H. Rose, formerly with the United States Bureau of Foreign and Domestic Commerce at New York, has succeeded Dr. W. C. Huntington as commercial agent in charge of the Chicago office of the United States Bureau of Foreign and Domestic Commerce.

Stephen L. Selden has resigned as vice-president of J. G. White & Company, Inc., and has resumed the practice of law. He has associated himself with Hardie B. Walmsley and Francis L. Kohlman, heretofore the firm of Walmsley & Kohlman, at 61 Broadway, New York City.

A. B. Gates, who was formerly assistant electrical engineer for the Sanitary District of Chicago and who has lately been assisting Gardner S. Williams, consulting engineer, in valuation and accounting work, has joined the engineering staff of the Commonwealth Edison Company of Chicago as engineer on generating stations.

Edward B. Ellicott, chief electrical engineer of the Sanitary District of Chicago, has tendered his resignation, which will become effective on May 25. Mr. Ellicott has completed eleven years of service with the Sanitary District. He plans to remove to the Far West, and will live during the summer seasons on his ranch in Idaho not far from Yellowstone Park. He will also open a consulting engineering office in Salt Lake City and will reside there in the winter.

H. W. Eddy, a former power salesman in the contract department of the Commonwealth Edison Company of Chicago sailed for Barcelona, Spain, on May 6. In a newly-created position with the central station company of the Spanish city he will act in an advisory capacity to the various company department heads installing, when conditions justify it, central station methods which have been successfully used in Chicago. Prior to his connection with the Commonwealth Edison Company, Mr. Eddy was a load dispatcher for the Washington Water Power Company. He is a graduate of the Chicago Central Station Institute.

W. H. MERRILL

William H. Merrill, who contributes to this issue an interview on the subject of the Underwriters' Laboratories, Chicago, of which he has been general manager since its inception, is a graduate of Massachusetts Institute of Technology, class of 1889. He came to Chicago in 1893, serving as electrician with the Chicago Underwriters' Association and, in 1894, having become associated with the Western Insurance Union, he organized the Underwriters' Bureau of Fire Protection Engineering. The laboratories founded in that year have since grown continuously in scope, equipment and buildings. Mr. Merrill assisted in the organization of the electrical committee of the old Underwriters' National Electric Association, and participated in the conferences which resulted in the National Electrical Code. Mr. Merrill, who is also president of the Laboratories, was secretary-treasurer of the National Fire Protection Association for six years and president of the association for two terms. He has long been a member of its executive committee and other important committees interested in the maintenance of electrical standards.

Obituary

Arthur J. Howard, for sixteen years with the Swett Electric Company and allied interests, which now furnish light and power to Medina, Brockport, Albion, Middleport, Lindenville, Gasport and Watertown, N. Y., died at his home in Buffalo, N. Y., on May 7. Since 1913 Mr. Howard had been manager of the Buffalo office of the Burke Electric Company of Erie, Pa., and prior thereto had represented the Crocker-Wheeler Company at Buffalo.

Edwin J. Emerson, who died at Boston on May 8, was manager of operation for the Eastern Texas Electric Company, a Stone & Webster organization which controls the Beaumont (Tex.) Electric Light & Power Company, the Port Arthur (Tex.) Light & Power Company, and the Jefferson County Traction Company. Mr. Emerson was a leading citizen of Beaumont, and had served for two terms as president of its Chamber of Commerce.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Slip-Ring Induction Motor

A new line of slip-ring induction motors, designated as Type CI machines and designed for severe, intermittent, varying-speed service, has

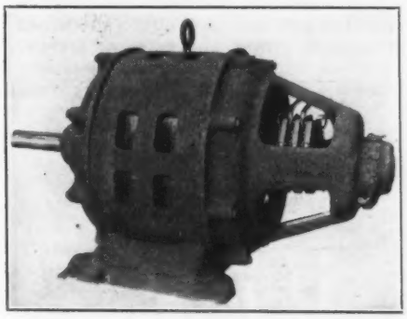


FIG. 1—75-HP. MOTOR WITH ROLLED-STEEL FRAME

just been developed by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. These motors are especially adapted for heavy-duty service on cranes, hoists, drawbridges, roller lift bridges, railway turntables, transfer tables and similar applications. They are being made in sizes from 1.5 hp. to 200 hp. for operation on two-phase or three-phase, 220-volt or 440-volt, 25-cycle and 60-cycle circuits.

The frames of the smaller sizes are made up of steel laminations riveted between forged steel and end shields; in the larger sizes the frames are made of rolled open-hearth steel. The brackets are of cast iron with reinforcing ribs to insure rigidity and perfect alignment of the bearings at all times. The bearings are self-oiling, of the oil-ring type, and large in size. The steel brush-holders are supported by and insulated

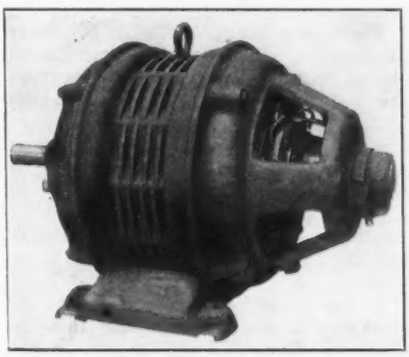


FIG. 2—10-HP. MOTOR WITH BUILT-UP FRAME CONSTRUCTION

from the bracket, which is open to permit easy inspection and renewal of the brushes.

The rotor is small in diameter, thus reducing the flywheel effect. This feature together with perfect balance and secure attachment of the windings, it is pointed out, makes these motors especially adapted for frequent starting, stopping and reversing. The shaft is of axle steel and can be removed from the rotor without disturbing the windings.

The running torque of these motors is said to be the maximum obtainable and the starting and pull-out torques in all motors exceed twice full-load torque. The machines are so constructed that in case of accident repairs can be quickly made, and maximum strength is obtained while weight and over-all dimensions have been reduced to a minimum. The illustrations show a 75-hp. motor, with rolled-steel frame and a 10-hp. machine with built-up frame construction.

Electric Hearing Device

The "Duplex Ear Phone" shown herewith has been developed by the Electrical Hearing Appliance Company,

FIG. 1—REAR OF TRANSMITTER, SHOWING RHEOSTAT FOR ADJUSTING TO DEGREE OF SOUND DESIRED

321 Madison Avenue, New York, for overcoming the handicap and inconveniences of impaired hearing. The device is very powerful and sensitive, it is pointed out, and all interior noises which are so common in electrical devices of this type have been entirely eliminated. It is adapted for use by the extremely deaf as well as by those who are moderately hard of hearing, since it can be instantly adjusted to any degree of sound by means of the sound regulator on the back of the transmitter. The transmitter is round, being 3 in. in diameter and 0.75 in. thick. The device can be utilized as a portable instrument and can be worn concealed in or on the outside of the clothing. Use is made of a small leather-cored carrying case which is 8 in. long, 5.25 in. high and 1.75 in. deep. There is a small opening in the front of the case which admits the sound to the trans-

FIG. 2—COMPLETE ELECTRIC HEARING OUTFIT

mitter when the instrument is used as a portable device. The transmitter and receiver are of aluminum and are heavily enameled. Electrical energy is obtained from a special dry battery which is being made in two sizes. The cord provided with the instrument is of heavy double-braided silk and has plug connections for the transmitter and battery. Instruments employing the same principle of sound concentration and refraction as the device described above are also being made for installation in churches, theaters and offices and for detective work.

Vertical Fan with Water Cooler

Fred J. Collins, 722 Washington Boulevard, Kansas City, Kan., has recently been allowed a patent on the vertical electric fan and water cooler, shown herewith, which, it is asserted,

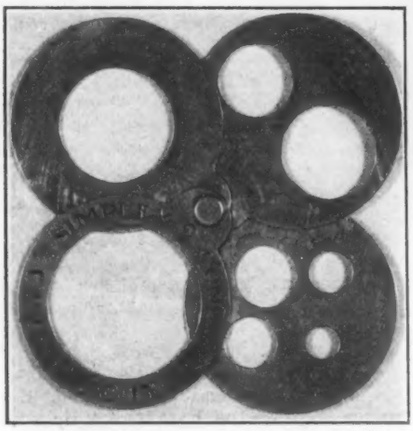
VERTICAL FAN WITH REVERSED BLADES AND WATER COOLER

will solve the problem of purifying and cooling the air and eliminate the draft caused by direct air fans. The blades

of the fan have been reversed and draw the air down over the bell-shaped base. The fan is 8 in. in diameter and the base is 16 in. in diameter. The edge of the base is in the form of a pan and has a capacity of 1.5 pints of water. With the 8-in. fan in operation it requires exactly seven hours of continuous running to evaporate the water. A few inches above the water are two metal collars, the lower one being vertical, and the upper one at an angle of 6 deg. These collars serve to break the air currents which come down over the bell in a rolling circuit. The collars cause the air to fall over the edge of the bell and into the water-filled base and then out into the room. The device was tested in July after sealing the room for six hours. The temperature was then at 95 deg. Fahr. and when the fan was set in motion the temperature was lowered to 90 deg. Fahr. within thirty minutes. Mr. Collins believes that this fan will prove of excellent use as a fumigator for hospitals, because of the fact that burning fumigating substances often prove too strong for the patient and can only be modified by opening a window which causes a draft through the room. The fumigating substances can be used in this fan in liquid form, either hot or cold, and of course the use of them can be controlled. When placed on a desk the fan will not cause papers to be disturbed.

A Cable Rating Gage

In the accompanying illustration is shown a metal gage consisting of four disks with holes accurately drilled to the internal diameters of eight sizes of "Simplex" heavy-gage conduit, the bore of the light gage being somewhat larger. The device is being made by the Simplex Conduits, Ltd., Garrison Lane, Birmingham, England. It is supplied in a neat leather case together with a booklet giving the working instructions. This booklet is provided with cards containing sectional diagrams of various sizes of cable. On the



METAL CABLE-RATING GAGE

cards with which the disks should be used can be found the exact diameters of the most used sizes of wiring cables, so arranged as to take up the minimum space, that is, to give the maximum conduit capacity. If the metal gage is placed over any of these cards, the maximum number of cables the conduit will contain, that is, the "cable rating" for any particular size of conduit, can be readily determined. The manufacturer directs attention to the fact that due allowance must in all cases be made for the actual run of the conduit, as it is inadvisable at any time to attempt to wire conduits to their full rating.

Electric Gas Lighter

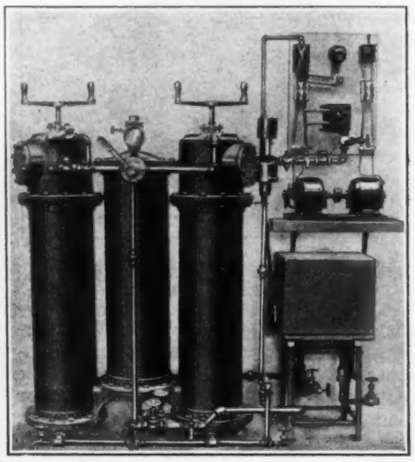
A gas lighter designed for use with 110-volt lighting circuits where the secondary grounded system is employed has been developed by R. F. Dowdy, Roanoke, Va. The device consists of an insulated hollow handle of convenient size with a screw cap at the upper end. This handle contains a 5-amp. resistor with a 6-amp. fuse at the top. As shown in the accompanying illustration, near the lower end of the lighter is an insulated push button which is used to make and break the circuit between

ELECTRIC GAS LIGHTER LOCATED CONVENIENTLY ABOVE GAS STOVE

the resistor and the electrode. The electrode consists of an iron rod projecting from the lower end of the handle and is protected by a fiber shield which extends to the shoulder of the point of the electrode. Use is made of a single-conductor heater cord as shown, one end of which is connected to the ungrounded side of the line while the other end passes through the screw cap in the upper end of the lighter and is connected to the terminal of the fuse which is in series with the resistor. The lighter is conveniently held out of the way when not in use, by means of a tension spring tied in the cord. Sufficient cord is provided so that all burners to be ignited including that in the oven can be reached. With this device 64,000 lights can be had for one kilowatt-hour, or about 6400 lights for one cent; it can therefore be operated at a cost sixty times less than that obtained with matches. The lighter is particularly advantageous because of its convenience and safety.

Electric Water Sterilizer

Water for drinking purposes should be pure. That is, it should be free from vegetable and animal impurities, which are said to afford nourishment for the



WATER STERILIZER WITH SMALL MOTOR-GENERATOR SET

bacteria and germs of typhoid, malaria and other diseases. Managers of large apartment houses and hotels find it profitable to maintain good systems for the purification of their water. Bottling plants that prepare carbonated liquids spend much money in water purification, so that the pure fruit juices and extracts in their finished beverages are not spoiled. Many large companies are also making considerable money selling purified table water, and large up-to-date manufacturing plants and department stores are installing purification systems.

There are many methods of water purification, some people using filters, others chemicals, while still others treat the water by heat to remove the bacteria and germs. Each of these methods will do the work required but there are objections to all such systems. It was due to these objections that the Electric Water Sterilizer Company of Scottdale, Pa., developed their standard No. 2 electric sterilizer, shown herewith.

It has long been known that electricity will decompose water into its elements—hydrogen and oxygen. It has also been found that at the time of the decomposition of the water, much of the animal and vegetable matter present in the water is rendered inert. The oxygen which is set free is in such a form that it will assist in destroying

the lower forms of animal and vegetable life. At the same time the plates, which are used to carry the energy into the water, throw off an insoluble compound that gathers in a mass around the vegetable and organic matter and makes it very easy to filter the whole out of the water by mechanical filters.

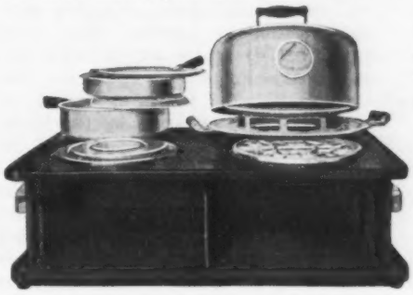
The sterilizer illustrated is composed of four essential parts, the electrode box, the coagulation chamber, the filter beds, and the automatic hydraulic motor and switch. The water to be purified first enters the electrode box. This box is made up of a number of metal plates containing slots through which the water is passed. There is a low energy consumption since the resistance of the water is of assistance in treating the water. After leaving the electrode box the water pours into the coagulation chamber where the germs and bacteria are brought together. These are filtered out during the passage of the water through two filter cylinders. The water comes from the second cylinder ready for use. The sides of the cylinder are covered with a layer of baked quartz to prevent any water from following what might be the smooth sides of the cylinder.

Whenever water is drawn from any faucet connected with the machine the hydraulic motor automatically closes the electrical switch so that power is being used only when the water is being drawn. When the water is turned off the hydraulic motor stops and automatically breaks the electric circuit. The electric circuit is insulated from the filter cylinder and water supply line by long insulating tubes, inserted in the metal piping under the electrode box, and the electrode box itself rests on four heavy porcelain knobs, thus preventing any grounding of the current. In installations where alternating current is only available a means of changing it to direct current is advisable, as in the latter form the energy consumption is less.

The illustration shows the electric water sterilizer equipped with a Westinghouse motor-generator set and control panel. The set is used to change the alternating current of the supply system to direct current for use in treating the water.

Portable Electric Range

In the accompanying illustration is shown an interesting type of portable electric range designed particularly for use in city apartments, country bungalows, etc. The E 9684 "Universal" range, as it is called, is rated at 600 watts, and can be operated from any ordinary lighting socket. It is 21.5 in. long, 13.75 in. wide, 15 in. high and is provided with a grill 7.5 in. in diameter, a disk stove 6 in. in diameter and a plate warmer space, 9.5 in. by 10 in. by 4.5 in. A 6-ft. heater cord with terminal connectors and Hubbell attachment plug is also provided. An oven, 10.5 in. by 4.5 in. inside, together with three grill cooking pans, 0.25 in., 1.25 in. and 2 in. in depth complete the cooking equipment. The E 19684 "Thermax" portable range is of the same size and is provided with the same equipment as that described above. It has a total rating, however, of 1200 watts, permitting 600 watts to

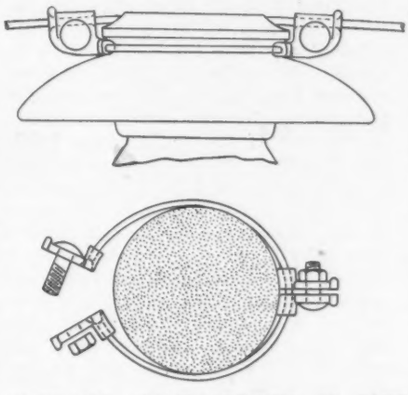


PORTABLE 600-WATT RANGE

be taken by each unit at the same time. It cannot be operated from a lighting socket as special wiring is necessary. This range is equipped with three-heat regulating snap switches. The portable ranges are being placed on the market by Landers, Frary & Clark, New Britain, Conn.

Insulator Clamps

According to Edwin G. Hatch, 120 Broadway, New York, who has developed the insulator clamp shown herewith, insulator clamps frequently have too much rigidity and also are not designed to meet slight variations in insulator sizes. Owing to the first difficulty, he points out, clamps have often injured insulators by chipping or else caused crystallization of the line wire. The second trouble, due to variations in insulator sizes, has often prevented clamps from fitting the insulators and line wire or else fitting them too tightly with the result that some part was injured. Due to this same difficulty, line wires have sometimes been carried entirely above the insulators when they were in fact somewhat smaller than usual. The clamp shown herewith is made with clamping members so hinged at the ends that they can readily take any vertical angle below or above the

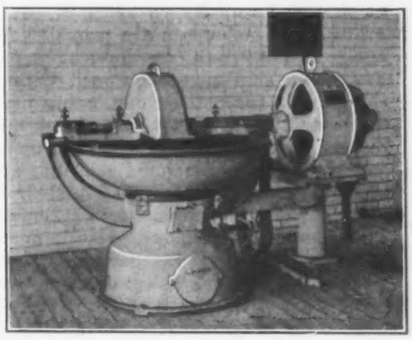


INSULATOR CLAMP DESIGNED TO TAKE LINE ANGLE WITHOUT KINKING LINE

horizontal which the line may assume and without kinking the line. This, of course, has its advantages in ordinary construction and especially in hilly countries. Provision for a slight variation is also made in the insulator grooves so that the line will always rest in the bottom groove of the insulator, which should be the part where the weight is carried. The clamping members at one end are free to move around the encircling wire so that should the insulator top groove be slightly off center, adjustment can readily be made for such a contingency. It is also possible to put the clamp quickly on the insulator where it will remain in place without further attention, it is claimed, in case it is not desired immediately to bolt it into place. The clamp is of sherardized malleable iron.

Electric Meat Cutter

The meat cutter illustrated herewith, the latest improved Crescent silent cutter made by the Brecht Company, St. Louis, Mo., has been developed to meet the demand for a silent-running machine suitable for cutting sausage meat, mincemeat, pickles, cabbage,



IMPROVED MOTOR-DRIVEN MEAT CHOPPER

fruit and other food products. The illustration shows the No. 1 machine which has six knives, a capacity of 250 lb., and a bowl 43 in. in diameter. It is operated by a 30-hp., 230-volt, 1150-r.p.m., constant-speed, commutating-pole, direct-current Westinghouse motor, directly connected to the cutting shaft which in turn is belted to a countershaft geared to a worm mechanism for turning the bowl. In operation the knives and the bowl revolve simultaneously. A vertical shaft in the base of the machine turns the bowl. A collar near the bottom has a ball race and fits in a cup filled with oil in which the balls run. This cup rests in a heavy crosspiece that carries the weight of the bowl. The bowl itself is held in place by four or more bronze side bearings which can be adjusted to fit and when once adjusted will hold the bowl in place in correct relation with the travel of the knives. The knives must follow a circle inside of the bowl. The outer top edge of the bowl is flat and fits so closely under the table that meat cannot escape when being chopped. The under edge of the bowl has a lip preventing drip from running down on the outside. In the center of the bowl-shaft there is a dental clutch. This clutch turns the bowl by engaging a worm wheel. The ball race supports the vertical bowl-shaft and takes the thrust

and combined weight of shaft, bowl and contents. This feature, together with the perfect alignment obtained by the bronze-adjustment bearings, renders the machine as near frictionless as it is possible to make it, it is claimed, and accounts for its steady motion and smooth running. Besides the size illustrated, this make of cutter is made in two other sizes, with capacities of 50 lb. and 100 lb. respectively.

Electric Unit for Driving Kitchen Appliances

A useful kitchen appliance is shown in the accompanying illustration and is designed for operating such devices as bread mixers, meat grinders, coffee or spice mills, ice cream freezers, raisin seeders, cherry pitters, potato slicers, cake mixers, egg whips, etc. It is also provided with buffing and grinding-wheel attachments for polishing and sharpening cutlery. The unit is equipped with a driving arm which may be raised or lowered to suit the height of the appliance which it is operating. Attachments are provided for horizontal as well as vertical drive. The drive shafts are equipped with a chuck and crank, the chuck being used where the handle of the appliance can be easily taken off while the crank is employed where the handle of the appliance cannot be removed. A shelf is also provided for supporting appliances which have table clamps. Use is made of hooks to hold the appliances in position while they are being driven. The unit is operated by a 1/6-hp. motor, which may be provided either for direct current or alternating current for any voltage or cycle desired. The "Reco" unit, as it is called, is finished in dark maroon, while the shafts are nickel-plated or of polished steel. A machine of the type shown should be a boon to all housekeepers, the manufacturer points out, since it saves labor and time. It is being made by the Reynolds Electric Company, 422 South Talman Avenue, Chicago, Ill.

GENERAL UTILITY KITCHEN DRIVING UNIT

Steam Soot Blower System

A system for removing soot and fine ashes from the heating surfaces of vertically-baffled water-tube boilers, and based essentially upon projecting powerful oscillating steam jets into, through and laterally across the spaces between the horizontal rows of tubes in planes parallel to the pitch of the tubes, has been developed by the Bayer Steam Soot Blower Company, of St. Louis, Mo. The soot blower has been so designed that the parts can be placed without cutting or changing brick work and walls, the original cleaning openings and internal wall angles in the side of the boiler being ample to permit a wide swing of the nozzle heads.

The nozzles are divided into groups or individually controlled blowing units, as shown in Fig. 1, one of which serves each gas pass or compartment and is fitted into each of the cleaning pockets originally provided along the side wall for hand cleaning. The individual units receive their steam in common from the superheater or from a 2-in. opening in the top of the main steam header, the steam supply line passing below the blowing units and having a drain at the lowest point to permit the removal of any possible condensation just before each blowing operation. The action of the jets through the direct force and expansion of the steam is to create intense momentary drafts that loosen the objectionable particles and push and pull them out of the gas passages into the stack.

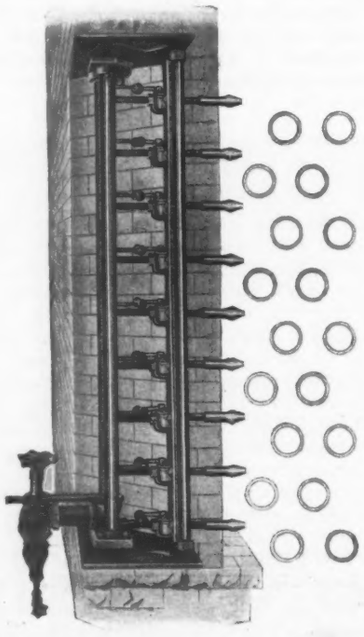


FIG. 1—SOOT BLOWER SHOWING METHOD OF CLAMPING METAL COVER PLATE

The method of imparting oscillation to the nozzles will be understood from Figs. 1 and 2. Each blowing unit has a vertically and centrally located riser connected to the steam line, and controlled by its own valve. Short branches extending inward from the riser in a vertical series, and equal in number to the space planes between the horizontal rows of tubes connect the riser with swing joints, the moving members of which are connected through nipples to the three-way nozzle heads within the furnace wall. A vertical rock shaft located at the side of the riser and provided with a single operating handle connects with the moving members of the swing joints through sets of links and levers. By seizing the operating handle and rocking the shaft alternately from right to left limits, the entire series of nozzle heads is correspondingly swung back and forth through wide arcs, and if the stream has been turned on it will be delivered in three separate powerful jets from each nozzle which sweep every nook and corner in the gas-pass or compartment and agitate and remove the soot and ash deposit.

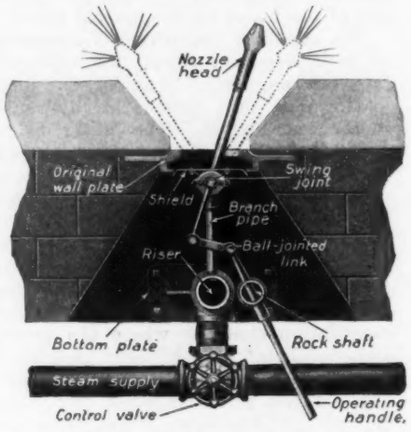


FIG. 2—SOOT BLOWER FOR VERTICALLY BAFFLED BOILERS

The nozzle heads are designed according to their location. The type of swing joint used, in addition to permitting easy installation, inspection and overhauling, may be brought squarely up against the cover shield which closes the cleaning pocket, and is tilted to the same pitch as the tubes. This permits the steam to sweep at all points within the plane spaces between the tubes, which is essential to thorough cleaning.

The swing joints all being bolted to a metal cover shield which fits against and is clamped to the two strips on the wall plate (Fig. 1), the cleaning pocket is made permanently airtight and the unit is located when the shield is clamped into place. The riser and rock shaft terminals at the top and bottom of the blower unit are special cast plates, each having four heavy set screws that fit respectively against the iron lintel and sill of the cleaning pocket. Adjustment of the units in permanent position can be completed while the boiler is in service and the rest of the installation is merely a matter of piping.

To avoid possible inefficiency in boilers having many vertical rows of tubes, the risers in the blower units are divided in the middle by a blind coupling, and separate steam supplies are piped to the top and bottom halves. Double-deck boilers having two cleaning pock-

ets, one above the other, for each pass are provided with a corresponding double arrangement of blower units, each having its own branch and controlling valve from the steam supply. The units of the Bayer system either with or without modification or in connection with other types of Bayer soot blowers can be applied to almost any other make of vertically baffled water tube boiler, it is claimed.

Three-Voltage Bell Transformer

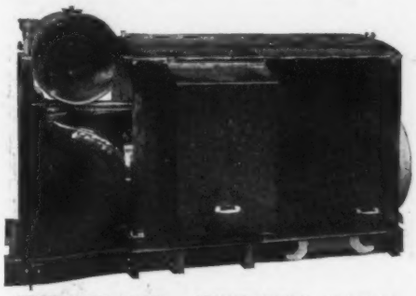
The "three-way" bell transformer shown herewith has been developed by the Thordarson Electric Manufacturing

BELL TRANSFORMER WITH THREE SECONDARY VOLTAGES

Company of Chicago, Ill. It is designed to give secondary pressures of 6 volts, 8 volts and 14 volts. According to the manufacturer, the device has been designed to give the maximum capacity allowed and approved by the Underwriters Laboratories, Inc. It is neat in appearance and as it weighs only 2 lb. is easily attached.

Gasoline-Engine-Operated Generating Set

In the accompanying illustration is shown a recently developed gasoline-engine-operated generating outfit, con-

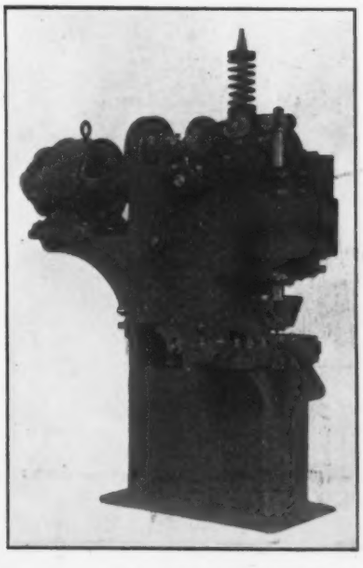


SELF-CONTAINED GENERATING OUTFIT INCLOSED IN METAL BOX

sisting of a direct-current generator directly connected to a small gasoline engine, a switchboard and gasoline tank. The set is designed particularly for use without a storage battery, although it may be employed with a battery if so desired. According to the manufacturer, the B. F. Sturtevant Company, Hyde Park, Boston, Mass., a sensitive governor control insures a constant voltage through wide variations of load. A special type of disk fan is mounted on an extension of the generator shaft, and is arranged to blow air through a cellular-type radiator. The entire apparatus is mounted upon two channel irons, and the engine, generator and switchboard are covered by a sheet-metal housing, similar to an automobile hood. The engine is of the four-cylinder, water-cooled, vertical type with either four or six cylinders, according to the size of the unit. The set is being built in three sizes with ratings of 5 kw., 10 kw. and 15 kw., which are capable of lighting 200, 400 or 600 20-candlepower tungsten lamps respectively. Both engine and generator may be operated under an overload of 25 per cent for two hours. Sets of the type shown have been sold to the United States government for use in aeronautical training camps, hangars, shops, etc., and for operating field searchlamps. One of the outfits is being successfully operated at the United States Signal Corps Aviation School at San Diego, Cal.

Electric Semi-Automatic Burring Machine

In the accompanying illustration is shown an electrically-operated semi-automatic burring machine for remov-

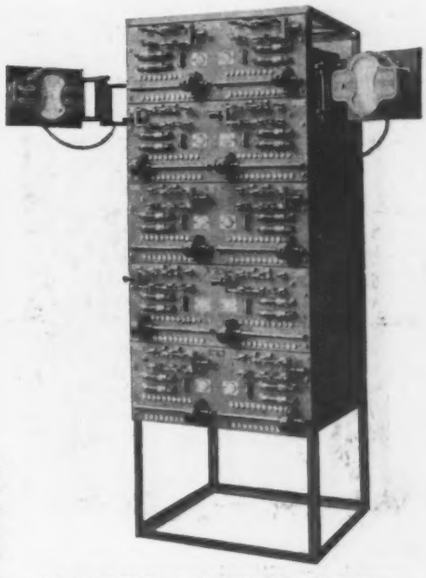


MOTOR-DRIVEN BURRING MACHINE

ing the rough edges or burr from all standard sizes of square and hexagonal hot-pressed nuts, manufactured by the National Machine Company of Tiffin, Ohio. It is operated by a directly connected, adjustable-speed, direct-current Westinghouse motor having a two-to-one speed ratio with a maximum speed of 1160 r.p.m. With this machine it is only necessary for the operator to place the nuts in the slot and push them forward. The raising and lowering of the spindle and the placing of the nuts under the cutters are done automatically, thus removing liability of accident incident to feeding nuts under a rapidly revolving cutter. An injector automatically moves the nut to be burred under the cutting head, and the operation is performed on the downward movement of the head. The head is then raised, and the operator moves the row of nuts forward, the next incoming nut ejecting the finished nut. The machine has an output of from two to four times that of hand-operated machines, and a much more uniform finish is secured as all of the burr is removed. A new type of burring head is used, which effectually cuts off all the fin, as the cutters are gradually lowered by a cam feed. Safety reliefs are provided upon the vertical movement of the burring spindle and on the nut injector, and a safety spring takes care of any variation in nut thicknesses. The machine can easily be changed over from one size of nut to another.

Garage with 80-Volt and 105-Volt Supply Circuits for Charging

In the Sterrett & Fleming Garage, Washington, D. C., pressures of 80 volts and 105 volts are available for charging, and it is the practice there to charge from twenty-four cells to thirty-six cells from the 80-volt busbars, and in the case of thirty-six cells, when the pressure comes up to approximately 80 volts, to throw over to the 105-volt busbars to finish the charge. With forty or more cells the charging is entirely from the 105-volt circuit. The battery-charging equipment in this garage consists of forty units made by the Cutler-Hammer



TEN-CIRCUIT CHARGING EQUIPMENT

Manufacturing Company of Milwaukee. The first installation consisted of the ten-unit rheostat panel shown in the illustration, while a thirty-unit equipment supply current for thirty ad-

ditional charging circuits was installed later. This equipment consists of three sets, each of which is an exact duplicate of the first installation shown. The duplex meter at one end is connected to the 80-volt supply and the other meter to the 105-volt busbars. The features of the unit-type charging sections are standard, except for the throw-over switches, and have previously been described in these columns.

Electric Instantaneous Water Heater

An interesting type of electric water heater has recently been brought out by the Foster Electric Company, Colton,

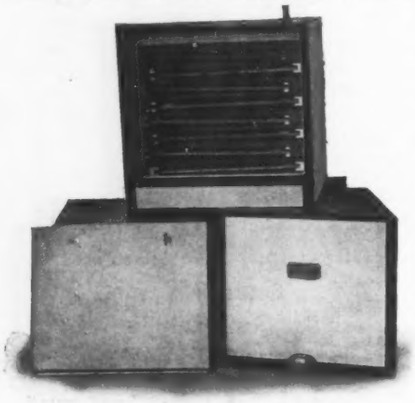


FIG. 1—UNASSEMBLED VIEW OF CUBICAL INSTANTANEOUS ELECTRIC WATER HEATER

Cal. The device is cubical in shape, the dimensions being 20 in. by 20 in. by 20 in. Water enters under pressure and passes onto a copper pan, then being conveyed over a series of copper trays in thin layers, its direction being reversed as it passes from one pan to another. The heating coils are between the copper pans and rest on porcelain insulation, making it impossible to get any electrical energy into the water. The heat from the coils does not pass

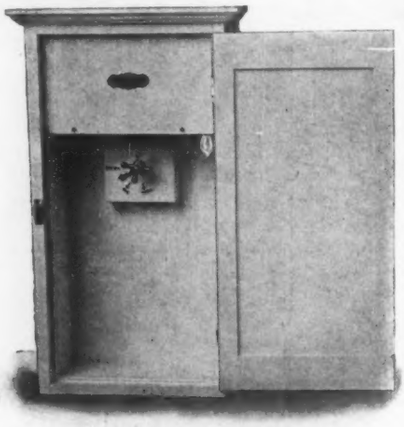
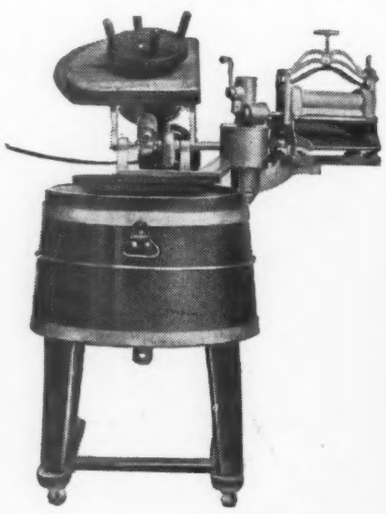


FIG. 2—REMOTE CONTROL BOX

through any obstructions in getting to the water, except through a thin layer of air. Because of the fact that the water is flowing by force of gravity, there can be no explosion, the manufacturer points out; there can also be no accumulation of lime or other magnesia deposits, it is asserted, since the elements are not under pressure while the water is passing through the heater. The temperature of the water may be regulated from the boiling point down to a lukewarm temperature. The outside jacket of the heater is of fireproof material. The electrical circuit is connected to a piece of low fusing metal, so that the current will automatically be shut off in case no water is passing through the heater. The heater is designed to operate on either 220-volt or 110-volt circuits. In Fig. 2 is shown the controlling box utilized with the water heater, which can be placed in any location desired and recessed into the wall. The lower part of the box is designed for storing bath room accessories while the upper part is used to control the electric circuit and to turn on the water at the same time as the circuit is closed. The indicator pointing to the words "off," "hot" or "warm" shows at a glance just how far to turn the lever to change the temperature of the water. A small pilot lamp is provided in the upper right side of the cabinet. According to the manufacturer, the heater operates at an efficiency of 95 per cent and will heat sufficient water for a bath in ten minutes.

Motor-Driven Dolly-Type Washer

In the accompanying illustration is shown an electric washing machine of the direct-drive type developed by the



ELECTRIC WASHER WITH TOP RAISED

Clarinda Lawn Mower Company, Clarinda, Iowa. Power is transmitted from the motor, which is of Emerson make, to the main drive shaft through a worm and spiral gear. All gears and working parts are completely inclosed in a dustproof casing, making the machine both safe and silent in operation. The motor and mechanism are placed on top of the tub, as shown, and all oil holes are in plain view so that oiling will not be neglected. The wringer is of the swinging reversible type and is provided with ball bearings and safety release. It runs in any position desired and swings clear of all obstructions, so that it may be used in connection with two tubs and basket, without moving the washing machine. The top of the machine may be opened as shown in the illustration, so that both hands can be employed to feed the wringer. A drain spout is provided at the bottom so that the tub drains perfectly without tilting. The tub of the machine is of Southern cypress.

Ornamental Light-Diffusing Fixture

A fixture, which is said to add to an ordinary lamp certain features of

FIG. 1—DOUBLE DIFFUSING UNIT

light diffusion that heretofore could be attained only by a very expensive lighting system, has been brought out by the George C. Lynch Company, 236 Fifth Avenue, New York. The "Difusolite," as it is called, is being made as a double unit, as shown in Fig. 1, consisting of a double bank of lamps

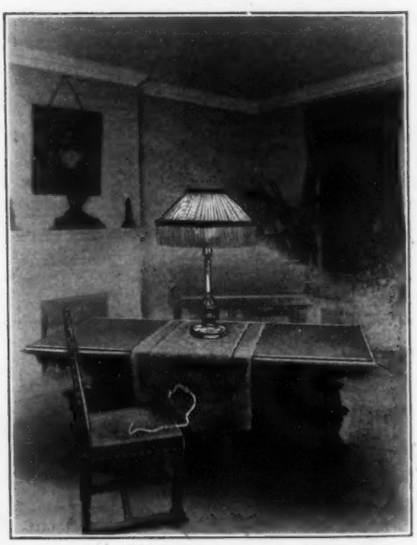


FIG. 2—TABLE LAMP EQUIPPED WITH DOUBLE DIFFUSING UNIT AND SHADE

inclosed in two bowls of specially made glass, and as a single unit which is made up of a single bowl containing a

single lamp. Shades are supported on the rim of the diffusing bowl, the fixture used as a table lamp being shown in Fig. 2. The fixture is also well adapted for use with floor units. The single unit is operated by a pull chain, while the double unit is operated by a switch in the base. The fixture may be equipped with a special dimming device so that the light can be turned up or down as can a gas or oil lamp.

Flow Meter

In the accompanying illustrations is shown a flow meter, which is designed to measure accurately the amount of fluid (steam, water, air or gas) passing through a pipe to which the instrument is attached. The measurement is accomplished by a small electric current which is regulated by the flow of the fluid, and is recorded on electrical instruments mounted on a panel at any distance desired from the pipe. The instruments while measuring the current regulated by the flow actually register the amount of fluid passing through the pipe.

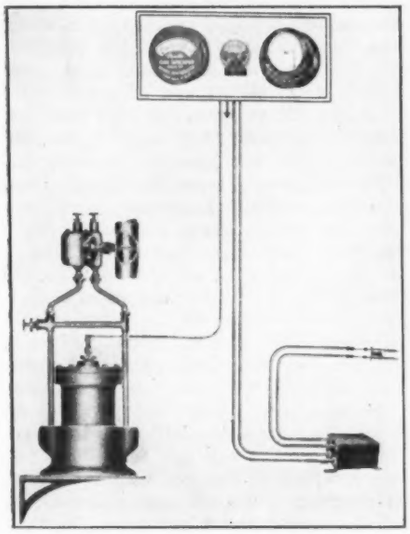


FIG. 1—COMPLETE FLOW-METER OUTFIT

A complete installation is shown in Fig. 1 and comprises a transformer for providing a low-voltage circuit, to which are connected the instruments on the panel and the meter body. An averaging Pitot tube inserted into the pipe where the flow is to be measured, transmits the pressure difference created by the flow to a mercury column in the meter body. The rise and fall of the mercury column is made to engage and disengage suitable conductors regulating the amount of energy flowing through the circuit. Accordingly, the total amount of energy measured by the flow integrator is the exact equivalent to the total amount of fluid passing through the pipe, and the instantaneous current shown by the indicator and recorder is equivalent to the instantaneous flow of fluid through the pipe.

The meter is particularly advantageous because the action is performed by means of electric current, thus avoiding all uncertain mechanical movements. The accuracy of highly refined electrical instruments, combined with the well-known accuracy of the averaging Pitot tube, also insures the accurate measurement of the flow. Furthermore, the instruments for indicating, integrating and recording the flow can be arranged to meet all possible conditions, it is claimed, because they can be either separated, or combined, or duplicated, and can be placed at any desired distance from the pipe line.

In Fig. 2 is shown in detail the construction of the flow meter. The averaging Pitot tube, which is shown inserted in the pipe, has two sets of openings leading to two individual reservoirs. The dynamic tube, which is facing the flow, is connected to the dynamic reservoir, and the static tube, which is facing in the opposite direction from the flow, is connected to the static reservoir. Each reservoir is equipped with a blow-off device, permitting the Pitot tube to be cleared without disturbing the meter or connections. The dynamic and static reservoirs communicate with their respective ends of the equalizing connection at the top of the meter body. The dynamic connection leads to the mercury well and the static connection to the contact chamber. When the meter is in operation the equalizing valve is closed, and the mercury level is depressed in the mercury well and raised in the contact chamber in proportion to the impact of the flow.

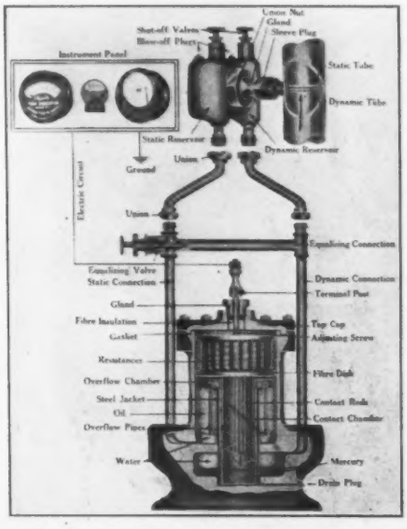


FIG. 2—DETAILS OF CONSTRUCTION OF FLOW METER

The contact rods suspended vertically in the contact chamber are connected to resistors held in position by two fiber disks. The resistors are wound on a series of spools ending with the terminal post which is insulated from the meter body, and forms a part of the circuit comprising the transformer, the meter body and the electrical instruments measuring the current. The successive ends of the contact rods are uniformly decreased in length, and each successive rod coming in contact with the rising mercury cuts out a given part of the series resistance, increasing the flow of the current in the circuit in proportion to the flow of fluid in the pipe. The contact rods and resistors are insulated by means of oil, which entirely fills the contact chamber above the mercury and also the annular space between the meter body and contact chamber. This prevents water and foreign substances from reaching the contact rods. The steel jacket provides a safeguard against breaking the mercury seal in the contact chamber.

A small rotary converter is provided with the outfit when direct-current energy only is available, since the meter depends on alternating current for its operation. It is a four-pole machine, has large bearings and commutator dimensions and runs at 1800 r.p.m.

The flow meter is being placed on the market by the Republic Flow Meter Company, 565 Washington Boulevard, Chicago, Ill.

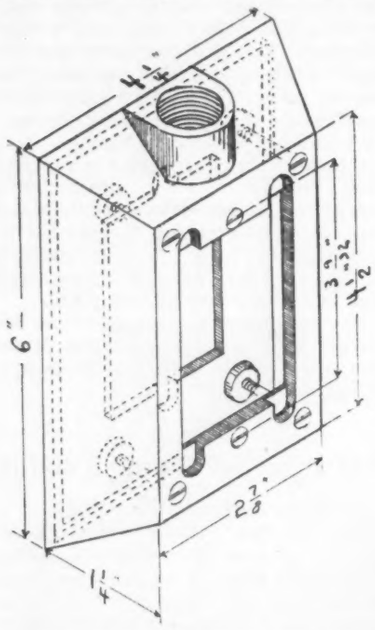
Motor for Winding Talking Machine

The "Motrola," which is shown herewith, is a small motor-driven device designed for winding a talking machine. The axle of the motor is connected to a worm gear which operates a wheel. This wheel, in turn, is fastened to the winding rod. Connected to the electric circuit, the device winds up the talking machine to about three-quarters of its capacity. Use is made of a spring, the resistance of which causes the electric circuit to be automatically cut off when the above-named limit in capacity is reached. When the talking machine runs down to about one-half of its capacity the spring resistance is lost and the current is automatically turned on again, thus the device keeps the spring of the talking machine constantly wound up between one-half and three-quarters of its full strength, which is said to be the strength required to give even time and true tones. The device is being placed on the market by Jones-Motrola, Inc., 169 Madison Avenue, New York.

MOTOR-DRIVEN DEVICE FOR WINDING TALKING MACHINES

Switch Box Adapter

In the accompanying illustration is shown a fitting developed by the Fancleve Specialty Company, Boston, Mass., and designed for use with a



ADAPTER FOR USE WITH CONCEALED SWITCH BOX

concealed switch box. The back of this adapter, as it is called, may be fastened to the box with the same machine screws that are used to fasten the original switch or receptacle. The original switch or receptacle can be remounted on the face of the adapter and the wires taken off to some new location.

Larries for Serving Boilers

To take the place of individual chutes from coal bunkers to stokers, or even to firing aisle, where boilers are hand-fired, various types of larries have been

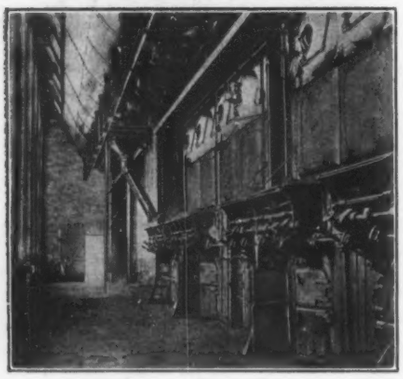


FIG. 1—HAND-OPERATED LARRY

developed by the R. H. Beaumont Company, Drexel Building, Philadelphia, Pa. The machines made by this company consist essentially of a hopper mounted on scale beams, the scale framework forming part of a truck having wheels which travel on a track under and parallel with the bunker. Coal is let into the hopper from the bunker, and, after being weighed, is allowed to pass into the stoker magazine through a chute extending from the hopper. Various types of larries ranging in size from small hand-propelled machines worked from the floor to those of large capacity, driven by motors and operated from a cage which is part of the larry framework.

A noteworthy feature of larries is the fact that bunker outlets can be spaced close together and at a uniform distance apart throughout, hence bunker gate spacing does not depend upon boiler setting as is the case where chutes are used. It will be readily seen that this leaves a minimum quantity of dead coal between the gates. Another feature of the larries shown herewith is the fact that they are equipped with scales so that an accurate record of the consumption of each boiler can be kept. Each scale is fitted with an automatic ticket recorder, so that a continuous record can also be made. When chutes are used, and if for any reason

FIG. 2—MOTOR-DRIVEN LARRY

any boiler is out of commission, all the coal in the bunker opposite that boiler is absolutely useless; with the larry, however, this coal can be drawn off and fed to the other boilers anywhere in the house. With larries, also, firing aisles are kept comparatively clear of stationary structures, enabling easy removal of tubes, or opening of boilers for washing or repairs.

As a general rule, the manufacturer points out, one man is sufficient to operate larries and other coal and ash handling equipment in a boiler plant of ordinary size. This is in great contrast to those plants where from six to fifteen men are required to handle ashes and coal manually.

In Fig. 1 is shown a floor-operated larry, a feature of which is ease of operation. Being of comparatively light weight, it is fitted with a chain of gears acting directly in conjunction with one of the axles, and has a rag wheel with chain attachment hanging within easy reach of operator on the floor. The operator has four distinct things to do: (1) Move larry; (2) open bunker gates; (3) weigh coal; (4) discharge to the stokers. The outfit shown in Fig. 1 is installed in the boiler room of the American Optical Company, Southbridge, Mass. In Fig. 2 is shown a motor-driven cage-operated larry which is installed in the boiler room of the Baldwin Locomotive Works, Eddystone, Pa.

Scintillator with 13-In. Projectors for Spectacular Illumination

A scintillator designed to accomplish the same purposes as those for which the San Francisco Exposition scintillator was used, has been installed at Seal Beach, Cal., at the end of a pier running out 900 ft. from the high tide line. For this purpose forty-eight 13-in. projectors used last year for lighting the tower of jewels were purchased from the Exposition Company and are grouped in the same manner as were the 48-in. projectors used on the Marina at San Francisco, except that in the Seal Beach scintillator a system of control levers couples up the units in sets of twelve for simultaneous operation. In this way four men operate the entire battery.

Screens are to be used to secure color effects and in addition to the flood lighting of the sea and the 400 ft. of beach which is exposed at low tide, it is planned to use on special occasions, smoke bombs and other fireworks that will provide an aerial background for lighting effects. The Bayside Land Company, which operates Seal Beach, has made provisions for a plant where the various pyrotechnic pieces required can be manufactured.

A 125-kw. motor-generator set is being installed on the pier head to transform current from the lines of the Southern California Edison Company which will be used in the battery. The idea of adapting the projectors to this use originated with Frank Burt, gen-

SCINTILLATOR FOR SPECTACULAR LIGHTING AT SEAL BEACH, CAL.

eral manager of the Bayside Land Company, who was formerly director of concessions at the exposition. E. J. Symmes is in charge of the lighting and architectural department for the company.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

National Meeting of the Institute

Electrical Engineers in Six Cities Hold Simultaneous Meetings by Telephone—Greetings from President Wilson—H. W. Buck Elected President A. I. E. E.

Meeting in San Francisco, Chicago, Philadelphia, Atlanta, Boston and New York, more than 5000 members and guests of the American Institute of Electrical Engineers, on the evening of May 16, conducted by telephone an adjourned session of the annual meeting held that afternoon in New York City.

There were present at Atlanta, Ga., 500 members and guests; at San Francisco 700; at Boston 900; at Philadelphia 850; at Chicago 1000, and at New York 1100; a total of 5050. Members at Denver and Salt Lake City, fifty and forty respectively, listened to the proceedings, but were not connected so as to take part.

The meeting was called to order at 8.30 o'clock Eastern time, the hour in Atlanta and Chicago being 7.30 and in San Francisco 5.30, the New York session being held in the Engineering Society Building, 33 West Thirty-ninth Street. From that point the roll of the cities was called. There President John J. Carty presided, greeted the various societies and read the following telegram from President Wilson:

"JOHN J. CARTY, President,
American Institute of Electrical Engineers:

"May I not extend my warm congratulations to you and to the members of the American Institute of Electrical Engineers upon the unique and singularly interesting meeting in which it has gathered its members in Boston, San Francisco, Atlanta, Chicago, Philadelphia and New York? To conduct such a meeting by telephone and make it possible for men scattered all over the country to listen to the proceedings and participate in them is certainly a most interesting evidence of the inventive genius and engineering ability represented by the Institute. It is with genuine satisfaction that I avail myself of this occasion to express my own deep appreciation of the work of the Institute in the development of the country's resources.

"WOODROW WILSON."

Announcement was made of the election of officers, which took place at the afternoon meeting. The new officers are: President, H. W. Buck, New York; vice-president, L. T. Robinson, Schenectady, N. Y.; Peter Junkersfeld, Chicago, Ill.; B. A. Behrend, Boston, Mass.; managers, John D. Fisken, Spokane, Wash.; Charles Robbins, Pittsburgh, Pa.; N. A. Carle, Newark, N. J., and Charles S. Ruffner, St. Louis, Mo.; treasurer, George A. Hamilton, St. Louis, Mo. F. L. Hutchinson was re-elected secretary.

Following the announcement of the election, President-elect Buck made a brief speech of acceptance to members of the Institute gathered in the different cities. Greetings were then sent by Dr. Alexander Graham Bell, past-president of the Institute and inventor of the telephone; Theodore N. Vail, president of the American Telephone & Telegraph Company; C. le Maistre of London, who is in this country as the personal representative of all the British engineering societies to

Seated with President Carty on the Platform are Alexander Graham Bell, Theodore N. Vail, M. I. Pupin, Thomas A. Watson, President-Elect Buck, and Others

PRESIDENT CARTY IN NEW YORK, PRESIDING BY TELEPHONE OVER MEETINGS OF A. I. E. E. MEMBERS HELD SIMULTANEOUSLY IN SAN FRANCISCO, DENVER, SALT LAKE CITY, CHICAGO, ATLANTA, PHILADELPHIA AND BOSTON

confer with the American Institute of Electrical Engineers and other American and Canadian engineering societies with regard to bringing about the formulation of rules of international standardization of practice, and Thomas A. Watson, who was so intimately connected with the birth and babyhood of the telephone.

After these greetings each section held a strictly local session, when addresses were delivered to the respective audiences as follows: New York, Dr. John H. Finley, president of the University of the State of New York; Boston, Dr. A. Lawrence Lowell, president of Harvard University; Philadelphia, Dr. Edgar F. Smith, provost of the University of Pennsylvania; Atlanta, Dean C. E. Ferris, engineering faculty University of Tennessee; Chicago, Dr. Harry Pratt Judson, president of the University of Chicago; San Francisco, Dr. Ray Lyman Wilbur, president of Leland Stanford, Jr., University.

Each of these speakers spoke of the benefits to humanity and the broad outlook of the world made possible by the achievements of the engineering profession. Distance has been reduced to nearness, and intelligence is carried with the speed of light. The engineer has made man a citizen of the globe.

MUSIC BY "LONG DISTANCE"

At the end of the local session long distance receivers were again taken up and greetings and music were sent to the general gathering by each one of the sections, one after the other, the selections played at the various cities being as follows: Atlanta, "Dixie Melodies"; Boston, "Yankee Doodle"; Chicago, "America"; New York, "Hail Columbia"; San Francisco, "Columbia, the Gem of the Ocean"; Philadelphia, "The Star-Spangled Banner." The remarkable meeting closed with an address by Dr. Michael I. Pupin, and greetings from the honorary secretary of the association, Mr. Ralph W. Pope, each talking at New York.

While such a meeting would, from its remarkable nature, attract wide attention at any time, just now it is of more than ordinary significance and importance. It illustrates in a notable manner the contributions of the nation's engineers to its "preparedness," and exhibits as nothing else could how much they have done to make this a really united country by the development of an efficiency that cannot fail to gratify the pride of every American.

Not only was the meeting national geographically, but its entire scope had the new spirit of nationalism. The meetings spoke for the achievements of the electrical engineer who has joined the North to the South and the East to the West.

PRESIDENT-ELECT BUCK

President-elect Harold Winthrop Buck, vice-president of the engineering firm of Viele, Blackwell & Buck of New York City, is one of the younger men prominent in engineering attainments, having been born on May 7, 1873. His father was a distinguished surgeon and on his mother's side his grandfather was the well-known historian Abbott.

At the age of twenty-one he was graduated from Yale with the degree of Bachelor of Philosophy, and in the following spring received his degree of electrical engineer from Columbia. He then entered the employ of the General Electric Company in the student department at Schenectady, where his ability soon found recognition. Besides designing a three-phase motor operating by static induction, Mr. Buck suggested many mechanical and electrical devices and took out several patents. With two associates he patented a process for the manufacture of carborundum in the electric furnace, which process was developed and placed in commercial operation at Niagara Falls. During the latter part of Mr. Buck's connection with the General Electric Company he acted as one of the assistants to the engineer of the lighting department.

Leaving Schenectady in September, 1900, he went to Niagara Falls, where he became the electrical engineer of the Niagara Falls Power Company and its allied interests, and remained in this position until 1908, when he moved to New York as partner in the corporation of Viele, Blackwell & Buck.

In this capacity he has since that time been intimately connected with the design and construction of the generating plants, transmission lines and distribution systems of the Great Western Power Company, California Electric Generating Company, Schenectady Power Company, Appalachian Power Company, and many others.

In co-operation with E. M. Hewlett, Mr. Buck developed the suspension insulator system now so widely used on high-tension transmission lines.

During the European war, Viele, Blackwell & Buck have acted as American representatives of important interests in London in connection with the purchase in America of engineering supplies for use in connection with the war.

H. W. BUCK

The president-elect of the A.I.E.E. and the cross-continental telephone line over which his speech of acceptance was transmitted.

Chicago Ready for N. E. L. A. Convention

Final Preparations Are Made for Business and Entertainment Features of Thirty-ninth Annual Convention

All preparations have been made for both the business and entertainment features of what promises to be the biggest convention ever held by the National Electric Light Association. The thirty-ninth convention, held this year in Chicago, starts on Monday and continues throughout the week.

Applications for rooms by delegates and others who will attend the sessions of the association have taxed to the utmost the accommodations arranged for by the local hotel committee.

SIX SESSIONS DIVIDED INTO TWENTY-TWO MEETINGS

At the twenty-two meetings scheduled to be held during the four business days there will be presented in the form of papers, reports, etc., a total of 2000 printed pages of material which, as was stated in the ELECTRICAL WORLD of May 6, is a record-breaker.

Convention sessions will be held in the gold room and the Florentine room of the Congress Hotel, and the new ballroom and Masonic room of the Auditorium Hotel.

The convention will be divided into six sessions. The general and executive session will be held on Tuesday at 10 a. m. and 8.30 p. m.; on Wednesday at 10 a. m., and on Friday at 10 a. m.; technical and hydroelectric sessions—Tuesday at 2.30 p. m.; Wednesday at 2.30 p. m.; Thursday at 10 a. m. and 2.30 p. m.; commercial sessions—Tuesday at 2.30 p. m.; Wednesday at 10 a. m. and 2.30 p. m.; Thursday at 10 a. m. and 2.30 p. m. and Friday at 10 a. m.; accounting sessions—Tuesday at 2.30 p. m.; Wednesday at 10 a. m. and Thursday at 10 a. m.; electric vehicle sessions—Wednesday at 2.30 p. m. and Thursday at 10 a. m. and 2.30 p. m.; and company sections sessions—Thursday at 2.30 p. m. and Friday at 10 a. m.

A prominent part will be taken at this year's convention by the new Electric Vehicle Section, formerly the Electric Vehicle Association of America. In addition to the opening address of Chairman Walter A. Johnson, this section will receive fourteen reports and will discuss seven papers at its three sessions.

ARRANGEMENTS FOR REGISTRATION

Headquarters of Secretary T. C. Martin and his staff, and of the general convention committee and the various sub-committees, including the registration booths, the hotel committee and the entertainment committee, will be maintained in the second floor foyer of the Auditorium Theater. An organization of about fifty or sixty of the employees of the Commonwealth Edison Company will be in attendance at convention headquarters in addition. The local entertainment committee will meet all special trains with automobiles to convey visitors to their hotels. Cards from the Chicago convention committee distributed on the trains will give information about this arrangement, and also about the transfer of baggage.

Secretary McConnaughy of the exhibition committee has been put to it to find enough space for Class D members who want to exhibit. The exhibition will be held in the Auditorium Theater, including boxes and lobbies. It will be opened at 9 a. m. on Tuesday, or perhaps on Monday night, and will be open from 9 a. m. to 6 p. m. on convention days. Possibly the exhibition will be open on Tuesday and Thursday evenings. So far as known at the present writing, admission to the exhibition will be restricted to persons wearing the convention badge.

The formal opening reception given by President E. W. Lloyd and the other officers of the association to delegates and visitors will be held at 9 p. m. on Monday, in the gold room of the Congress Hotel. Following the reception there will be dancing and light refreshments in the Elizabethan room of the hotel.

At noon on Tuesday, automobiles will be in waiting at the Auditorium and Congress Hotels to convey the out-of-town visiting ladies for a drive through the South Side parks and boulevards. Luncheon will be served at the South Shore Country Club at 1.30 p. m. followed by an entertainment consisting of music and dancing numbers. The ladies will also have the pleasure of witnessing a style show. The latest ladies' gowns for all occasions will be shown on living models. Returning by a different route, the party will reach the downtown hotels about 5 p. m.

At the conclusion of the first general session of Tuesday morning, beginning about noon, there will be a service-installation prize contest between three squads of linemen employed by the Commonwealth Edison Company. This contest will take place in Grant Park at the east end of Van Buren Street viaduct, and while it is in progress there will be music by the full Commonwealth Edison band. It is proposed to take a moving picture of this event.

ENTERTAINMENT FEATURES

A rejuvenation of the Jovian Order, of which many of the men who will attend the convention are members, will be held at the Palais de Danse, Bismarck Garden, from 5.30 to 7 p. m. on Wednesday evening. Thomas A. Wynne of Indianapolis, reigning Jupiter, will be present and make a short address. It is expected that a large number of other prominent Jovians will be in attendance. From 6.30 to 8 p. m. a table de hôte dinner will be served in the Bismarck Garden for those who wish.

What will be perhaps the most elaborate feature of the entertainment program is the Big Frolic at Bismarck Garden, beginning at 7.45 p. m. on Wednesday evening. Bismarck Garden, a beautiful amusement park on the North Side, will be the scene of a mammoth entertainment and carnival, including music, dancing and all sorts of stage shows and side shows, with traveling minstrels and troubadours—also favors—galore. There will be a special illumination of the building and grounds and the Frolic proper will end with a grand finale of fireworks, with electric-siren accompaniment. Dancing will be continued after the finale of the Frolic.

A *thé musicale* will be given for the out-of-town visiting ladies at the Blackstone Hotel from 3 to 5 p. m. on Thursday. The artists will be Miss Cyrena Van Gordon, mezzo soprano, of the Chicago Grand Opera Association; James Goddard, basso, of the Chicago Grand Opera Association, and Richard Wagner, cellist. Refreshments will be served at the conclusion of the musical program.

The Lighting Sales Bureau dinner, of which announcement has already been made, will be held at the Morrison Hotel at 7 p. m. on Thursday of convention week. The Klore orchestra will entertain during the beefsteak dinner, and the after-dinner program will consist of orchestra selections, vaudeville by professional entertainers and the Morrison Revue. The banquet committee, of which John G. Learned of the Public Service Company of Northern Illinois is chairman, has announced that all lighting men are invited to the dinner. Tickets may be obtained at $2 each at the convention registration bureau in the Auditorium Hotel.

Arrangements have been made by which visitors wearing the convention badge may inspect industrial establishments and other points of interest in Chicago.

Franklin Medal for J. J. Carty

On May 17 the Franklin Institute made the annual presentation of the Franklin and Cresson medals in the auditorium of the Institute, Philadelphia, Pa.

The Franklin Medal, founded in 1914 and awarded to "those workers in physical science or technology, without regard to country, whose efforts, in the opinion of the Institute, have done most to advance a knowledge of physical science or its applications," was presented to Prof. Theodore William Richards and to John J. Carty, chief engineer of the American Telephone & Telegraph Company. The Franklin Medal was founded two years ago by Samuel Insull of Chicago.

The award to Professor Richards was made in recognition of his "numerous and important contributions to inorganic, physical and theoretical chemistry, and particularly his classical series of redeterminations of the atomic weights of the more important chemical elements."

The award to Mr. Carty was made in recognition of his "long-continued activities in the telephone service, his important and varied contributions to the telephone art, his work in the establishment of the principles of telephone engineering, and his signal success in directing the efforts of a large staff of engineers and scientists to the accomplishment of the telephonic transmission of speech over vast distances."

GROUP AT PRESENTATION OF FRANKLIN AND CRESSON MEDALS AT FRANKLIN INSTITUTE, MAY 17

The Elliott Cresson Medal of the Institute, which is awarded for "discovery or original research, adding to the sum of human knowledge, irrespective of commercial value; leading and practical utilization of discovery; and invention, methods or products embodying substantial elements of leadership in their respective classes, or unusual skill or perfection in workmanship," was awarded to the American Telephone & Telegraph Company. The basis of the 1916 award of this medal to the American Telephone & Telegraph Company was its "constructive and far-seeing policy in the development of the art of telephony, in the promotion of telephone engineering, in the establishment of its telephone system in every part of the United States and for placing all of the States of the Union in speaking communication."

Professor Richards could not be present to respond in person because of illness. Mr. Carty in accepting the medal modestly stated that he received it as the engineer representing the work of a staff of engineers rather than as an individual. Theodore N. Vail, president of the American Telephone & Telegraph Company, accepted the Elliott Cresson Medal for that company. He emphasized the community of interests which must bind together the individuals of a telephone company in the maintenance of ideal service, saying that perfect service depended upon the right thing being done, at the right time, by the right person, in the right place. He stated that in accepting the medal for the company he was accepting it for each of the 170,000 men and women in the telephone organization.

At the conclusion of the presentation ceremonies, and by the courtesy of the American Telephone & Telegraph Company, demonstrations of transcontinental and wireless telephony were made in the auditorium of the Institute. Telephone communication by wire was had with San Francisco, and wireless from Arlington Tower of the Navy Department, at Washington, to New York and thence by wire to the auditorium of the Institute.

Convention of National District Heating Association at New York

With a registration of 175 steam heating men, most of whom are engaged in the central station industry, the eighth annual convention of the National District Heating Association held at the Hotel Martinique, New York City, from Tuesday to Thursday of this week, broke all previous records.

The convention opened on Tuesday morning with a business session and two committee reports, one by D. L. Gaskill, Greenville, Ohio, on public policy and the other by H. A. Woodworth, Indianapolis, Ind., on underground construction.

For the remaining sessions the following program was carried out:

TUESDAY AFTERNOON

Paper on "Factors in the Growth of District Heating," by S. Morgan Bushnell, Chicago, Ill.

Report of station operating committee by Byron T. Gifford, Grand Rapids, Mich, chairman.

WEDNESDAY MORNING

Address on "District Heating and its Relation to Electric Utility Operation," by Arthur Williams, New York City.

Report of education committee by George W. Martin, New York City, chairman.

Election of officers.

THURSDAY MORNING

Paper on "Co-operating with Consumer," by William J. Baldwin, Jr., Chief Engineer, New York Steam Company.

Address on "Appraisals of Utility Property," by M. F. Millikan, vice-president, American Gas & Electric Company.

Report of rate committee by A. E. Bettis, Kansas City, Mo., chairman.

THURSDAY AFTERNOON

Report of publication and editorial committee.

Paper on "Ratio of Economizing Coils of the Different Types of Heating Systems," by W. J. Kline, New York City.

Report of record committee by A. P. Biggs, Detroit, Mich., chairman. Paper on "Methods by Which Harvard University Buys Steam on a Heat-Unit Basis," by E. G. Bailey, Boston, Mass.

FRIDAY MORNING

Report of meter committee by F. B. Orr, Chicago, Ill., chairman.

Address by Travis H. Whitney, Public Service Commissioner of New York City.

Report of delegates to Pan-American Congress by Jas. A. Donnelly, New York City, and Nelson S. Thompson, Washington, D. C.

Results of the election of officers on Wednesday morning are as follows: President, Byron T. Gifford, Grand Rapids, Mich.; vice-president, George W. Martin, New York City, Chicago, Ill., and J. C. Hobbs, Pittsburgh, Pa.; secretary-treasurer, D. L. Gaskill, Greenville, Ohio. Executive committee: A. E. Bettis, Kansas City, Mo.; C. A. Gillham, New York City, and D. L. Gaskill.

Canada to Reply to United States Protest Regarding Niagara Power

A conciliatory reply to the protest of the United States regarding the taking of more water from the Niagara River for the purposes of the Ontario Hydro-Electric Commission, it is expected, will be sent to Washington in a few days by the Province of Ontario through the medium of the Dominion government. The understanding between the British and United States governments on the use of water from Niagara River above the falls for power as set forth in the international waterways treaty will be cited. The intention of the Hydro-Electric Commission to remain within the limits set forth in the waterways treaty will be stated, as also will be the fact that Ontario is prepared to see that private companies exercise the greatest economy in the use of the water for power purposes.

It was declared earlier in the week in Toronto by Attorney-General I. B. Lucas that the Canadian government has decided definitely to exercise what it claims to be its right to prohibit the exportation to the United States of power derived from the Canadian side of Niagara Falls if the United States persists in its protests against further water being taken from the river above the falls.

More than 145,000 hp. of the 260,000 hp. now developed, Mr. Lucas said, passes into the United States from the Canadian side, and the Dominion, by shutting off the exportation of this power, could tie up hundreds of American industries within a radius of 100 miles of the falls.

Larger Office Quarters for N. E. L. A.

The National Electric Light Association has increased the office floor space which it occupies on the eighth floor of the Engineering Society's Building on West Thirty-ninth Street, New York City, by the space formerly occupied by the American Gas Institute and the Empire State Gas & Electric Association. This gives the N. E. L. A. now more than 90 per cent of the floor space of the eighth floor, and since the society is contemplating taking on additional work of a character very useful to the industry, it is safe to infer that it will in the near future occupy the whole floor in the same manner as the three founder societies. Offices of the electric vehicle section have been moved up to the eighth floor, giving it much larger quarters than it had formerly.

The additional floor space will relieve to a large amount the inadequate office room which the former space offered for committee meetings. There are some fifty to sixty committees and sub-committees having in all about 500 members, and the crying need of the association has been for room to take care of the meetings of these committees. Frequently four or five committees are in session at one time. The additional floor space will amount to 2500 sq. ft., which, added to the 7500 sq. ft. formerly occupied, will give the association now some 10,000 sq. ft. of office space.

The rooms formerly occupied by the American Gas Institute will be used as a combination committee-board room. They will be so arranged that if necessary they will furnish two committee rooms and at a board meeting can be thrown open into one single room. The old board room will then be occupied by Secretary T. C. Martin as his office, and the office he now occupies will then be occupied by Mr. Marshall, secretary of the Electric Vehicle Association. Many other plans for a more efficient placing of the office force are being worked out in detail.

Engineers March for Preparedness

From early in the morning until well after nightfall the Citizens Preparedness Parade, well over 125,000 men and women strong moved up Fifth Avenue, New York City.

Conspicuous among the marchers was the engineering division with 6000 men in line, led by Lieut.-Col. Merritt H. Smith as marshal.

Behind him marched the Military Engineering Lectures Committee and an Honorary Parade Committee that included J. Waldo Smith, J. Parke Channing, Alfred Craven, Alexander C. Humphreys, William Barclay Parsons, John A. Bensel, J. J. Carty, George F. Kuntz, Herman A. Metz, H. de B. Parsons, E. A. Sperry, and M. G. Starrett.

PROMINENT ENGINEERS IN PREPAREDNESS PARADE

Left to right: Thomas Robins, Peter Cooper Hewitt, Thomas A. Edison and W. L. Saunders, members of the Naval Consulting Board.

The members of the Naval Consulting Board, among whom was Thomas A. Edison, marched with this division.

Commonwealth Edison Company Reduces Lighting and Power Rates

The Commonwealth Edison Company of Chicago, on the afternoon of May 18, announced a reduction in its electric service rates. The benefits to the patrons of the company through the reduction are estimated at $1,000,000 per year. In the retail schedule the primary rate will be reduced to 9 cents net, instead of 10 cents, for the first 30 kw.-hr. use of the maximum demand. The secondary charge will remain 5 cents for the next 30 kw.-hr. and the tertiary charge continues at 3 cents for all additional use. This reduction will apply to 258,000 of the company's patrons. Further reductions will also be made in the wholesale power and lighting rates. The primary charge for the first 50 kw. of direct-current service, which has been $2.60, will be reduced to $2.20. The primary charge for the first 50 kw.-hr. of alternating-current service, which has heretofore been $2.40, will be reduced to $2. The energy charge in connection with this wholesale rate has been 5 cents per kw.-hr. for the first 1000 kw.-hr. and 3 cents for the next 4000 kw.-hr. This energy charge will be reduced to 3 cents for the first 5000 kw.-hr.

The present rate reduction has been made voluntarily by the Commonwealth Edison Company in accordance with the company's policy of voluntary reduction in rates as fast as this can be done with safety from an economic point of view. The new rate schedule will go into effect when it has been approved by the State Public Utilities Commission of Illinois, probably about July 1.

Southwestern Utility Operators Hold Annual Convention at Galveston, Texas

Two hundred members of the Southwestern Electrical & Gas Association and representatives of manufacturing companies in Texas and the Southwest, assembled at the Hotel Galvez, Galveston, Tex., on May 17, for the annual four-day convention of the association.

The opening session of Wednesday was given over to the address of welcome by Mark H. Royston, city attorney of Galveston, the response by H. B. Head, assistant to the president of the Texas Power & Light Company of Dallas, and the official address of President David Daly, manager of the Houston Electric Company. The president's address was a forceful discussion of public utility affairs, dealing in particular with the jitney situation in the Southwest, and emphasizing the shortsightedness of the public in its attitude toward irresponsible jitney operation.

A report of the later convention sessions, being held as this issue goes to press, will be presented next week.

Samuel Insull Commends Commission Regulation

President of Commonwealth Edison Company Presents Strong Regulation Arguments at First Joint Convention of Iowa Public Utility Associations

Addressing a joint session of the Iowa Section, National Electric Light Association, Iowa Street & Interurban Railway Association, and Iowa District Gas Association assembled at the Julien Dubuque Hotel, Dubuque, Iowa, on May 10, 11 and 12, in the first annual joint convention, Samuel Insull, president of the Commonwealth Edison Company, recommended the regulation of public utilities by strong regulatory bodies centralized in the states. He could see no other solution to the problem of the relations of the public and the utilities than through the creation of such commissions, and greatly favored, in contrast to the Iowa situation where the regulation of utilities is left to the local governing bodies, the one centralized commission for each state; for by this plan the regulatory body would have greater resources, greater ability to employ expert talent in studying the conditions and would be free from local prejudices and petty politics.

"If there is anything wrong with my business, I want to know it," Mr. Insull said, "and the best way to find it out is to have the best talent available to investigate it, and this can be had only by the centralized commission." He went on to say that while this plan is now in force in Illinois, it is not popular, for there is so much talk in Chicago about home rule and so little real understanding about the requirements by those so agitating the question. He was sure the best results would be obtained by state commissions. Already thirty-three of the states have commissions with jurisdiction over the utilities, so that the trend is decidedly in that direction, and while it is possible for a large portion of the people to go wrong on a proposition, it is very unlikely that two-thirds of the states should be wrong on so fundamental a condition.

Mr. Insull stated that the only way to prevent duplication of investment and secure lowest rates for the consumers is by refusal of competitive franchises, which, of course, means exclusive franchises and monopoly. With a monopoly there is no question that the state should have the right to regulate. To perform its functions properly the utility must be a monopoly, and therefore it is the duty of the state to see that the rate to the consumer is based on the cost of service plus a legitimate return on the investment. The publicity of accounts and affairs which must necessarily follow state commission regulation, and the resulting confidence the public must acquire in the statements and findings made by the commission because they are from an unbiased body, will surely result in better feeling between utility and public. The local regulating bodies also cannot remain effective much longer on account of the many places where the public service companies are extending their operations beyond the jurisdiction of the local councils.

Mr. Insull sounded a note of warning to those utility men who are pushing their service into a territory already served by a similar company. He said that in all his activities in the utility business he had yet to find a case when it seemed necessary as a business proposition to invade a territory occupied by an existing similar enterprise. It is not necessary, nor economically desirable to parallel another man's business, and he strongly condemned this practice. He cited this as one instance of the failure of some public utility officials to realize the true scope of their responsibility.

Some Disadvantages of Commission Regulation

Mr. Insull also pointed out the disadvantages of commission regulation and cited as chief among these the poison of politics, which sometimes enters into the activities of commissions and interferes with their liberty of action. It is our duty as citizens, he pointed out, as much as utility men, to see that the commissions are kept free from political influence. The commission may also be destructive of initiative and enterprise if it is run too much by rule and by people uninfluenced by the enthusiasm of contact with the utility work. The states do not pay as much for brains as do the public utilities, and hence they are likely to lack knowledge of the larger enterprises, and to be incompetent in the big financial transactions. Some newly-created commissions have shown a tendency to think it their function to prosecute and persecute the utilities, and this misconception of their purpose has made it hard for the utilities involved. But when a utility is maltreated, it affects very largely the people of the community, for perhaps more than any other investment the utilities are popularly owned and the wage earners and widows and orphans dependent on their income from utility investment have as much right to protection as the operator. "If we would try to educate our employees and make it possible for them to invest their savings in the utilities, we would get more nearly justice from the public," said Mr. Insull.

Public Ownership Sequence to Failure of Regulation

Proceeding to tell the duty of utility men toward public regulation, Mr. Insull said: "If public regulation fails, public ownership should come. It will be the natural sequence. We must have monopoly, and having monopoly it must be regulated. With private ownership and public regulation, it is our duty to see that it does succeed. I do not believe that public ownership would succeed, but the people would insist upon this if regulation fails.

"Whatever form of regulation prevails, or whoever you are dealing with, maintain the best and most cordial relations. Also the same relations should be maintained with the public, for we cannot have the former without the latter. It is important for all of us to see that cordial relations do exist, first with the community, and then with the employees. Take the public into your confidence, not as a favor, but as its right. What you need and what will help you most is enterprise and initiative. Do not manufacture energy when

you can buy it cheaper. I buy and sell. Do not allow your prejudices for operating your own plant to keep you from buying power, if the other fellow can sell it to you cheaper than you can make it. Have a broad policy as to rates. Don't be afraid to sell energy too cheap. The greatest advantage the electrical industry has had has been that the gas people were asleep, and if they had been alive to the differential rates, diversity of loads, etc., instead of achieving in thirty-five years the position the electrical industry now holds, it would have taken seventy years. In saying this I speak as the head of one of the largest gas companies and am viewing the situation from the inside as well as from the outside. Go into consolidations and the holding company business on your own hook. See if you cannot cut down the operating cost by combining with three or four of the other small companies in your neighboring towns. The most 'hardened sinner' among us would like to feel that he has done some good, and few other men have so great an opportunity for doing something to help the people at large as the utility operator. They should do this as the duty they owe to the state and community, and should look more to the interest of the community and less to personal interest."

G. W. Clabaugh of the Omaha Electric Light & Power Company discussed some of the points raised by Mr. Insull.

ELECTRIC ASSOCIATION SESSIONS

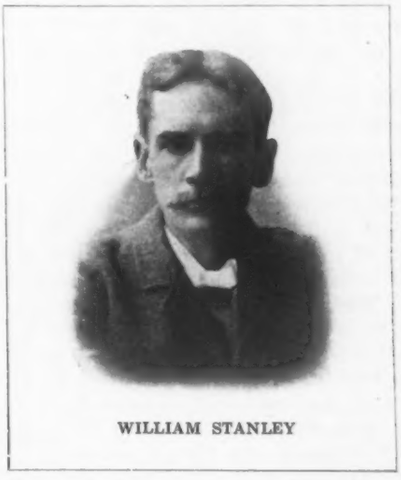
President E. M. Walker presided at the Friday morning and afternoon separate sessions of the Electrical Association. Dr. Saul Dushman of the research laboratory of the General Electric Company addressed the delegates on the "Results of Increased Knowledge of the Nature of Electricity" and showed the application of theory to X-ray work and wireless telephony. J. P. Ingle, general superintendent of the Keokuk (Iowa) Electric Company, made a report for the committee which is investigating the rates for insurance now being assessed by the new Iowa Rating Bureau, of which all insurance companies in Iowa are required to be a member. K. L. Walling, manager of the bureau, was present and addressed the members briefly as to the position of the bureau on matters of complaint, and assured them of his willingness to co-operate in making equitable rates. W. H. Burtis, vice-president and general manager of the Interstate Power Company, Decorah, Iowa, presented the committee report on "Possibilities of Business from Rural Transmission Lines," and the report was discussed briefly by Edward Soukup, Iowa Railway & Light Company, Cedar Rapids. Rufus E. Lee, manager of the Lee Light & Power Company, Clarinda, Iowa, presented the committee report on "Draft of Model Contracts Between Municipalities and Central Stations for Street Lighting," which consisted of a printed form of contract, a copy of which was given to each of the members. In the absence of Austin Burt, chairman of the committee, H. W. Wagner of Ames presented the report of the facts and factors committee, which is a compilation of the operating data of all central stations in Iowa for the past year. This, together with the committee report on "Collection and Compilation of Rates Charged Municipalities for Street Lighting and Water Pumping," presented by Edward Soukup of Cedar Rapids, and a report on the possibilities of business from rural transmission lines, will be published in a later issue of the ELECTRICAL WORLD. The committee report on the draft of a recommended ordinance regulating electrical construction in smaller towns was presented by M. G. Lyon.

The following officers of the Iowa section of the National Electric Light Association were elected for the following year: President, John M. Drabelle, electrical engineer of the Iowa Railway & Light Company, Cedar Rapids; vice-president, Herbert Bellamy, secretary and manager of the electrical department, Marion County Electric Company, Knoxville; secretary, L. E. Caldwell, manager of the Iowa City Light & Power Company; and assistant secretary, Rex H. Fowler, Des Moines Electric Company. The following men were elected members of the executive committee in addition to the above named officers: E. M. Walker, Dubuque, Chris. Miller, Clairmont, H. C. Blackwell, Davenport, Austin Burt, Waterloo.

The members and guests were entertained at a theater party on Wednesday evening, and at an all-association banquet at the Julien Dubuque Hotel Thursday evening. Following the banquet the Sons of Jove, having deemed it not advisable to put on a rejuvenation in view of the nearness of the prominent rejuvenation to be held in Chicago at the N. E. L. A. convention, a "joviation" was held at the Wales Hotel at which about 150 Jovians were present.

Death of William Stanley

Last Sunday, May 14, William Stanley, who has often been characterized as the father of alternating-current distribution, passed away at his home in Great Barrington, Mass., after a lingering illness. He was born in Brooklyn, N. Y., on Nov. 22, 1858, and prepared for college at the Williston Seminary, East Hampton, Mass., entering Yale University with the class of 1881. He left the University, however, in his freshman year, much against the wishes of his father, a prominent lawyer, who had aspirations for his son to enter the law, and took up the study of electricity by himself. He engaged in nickel-plating in New York City, where in 1879 he became acquainted with Hiram Maxim, whose assistant he subsequently became. At this time Mr. Maxim was chief engineer of the United States Electric Light Company of New York City.



WILLIAM STANLEY

Mr. Maxim went to Europe and Mr. Stanley continued for a while as assistant in the Weston Electric Light Company of Newark, N. J., which had absorbed the Maxim Company. During his subsequent connection with the Swan Electric Light Company, Boston, Mass., Mr. Stanley invented and perfected an improved method of exhausting incandescent lamp bulbs. Returning to Englewood in 1883, he conducted a private laboratory where he devoted himself to experimental work on storage batteries and other apparatus. In the following year he contracted with the late George Westinghouse agreeing to make certain investigations which, if successful, were to be taken up as business enterprises by

Mr. Westinghouse, in which Mr. Stanley was to receive a share as a return for his services. While in Pittsburgh in 1885 he devised the "multiple" system of alternating-current distribution, designing transformers and generators, and developing the system, but Mr. Westinghouse, however, was unwilling to spend any money for this development work. Mr. Stanley therefore carried this on at his own expense, hiring an abandoned rubber factory at Great Barrington, and building his apparatus. In the following spring, the apparatus having been built, it was placed in several of the Great Barrington stores and a regular commercial service begun. In April Mr. Westinghouse and some friends visited Great Barrington and inspected the plant. This visit led to the later development of the Westinghouse Electric Company and its construction of a second generating plant at Buffalo, N. Y.

Developed with Chesney and Kelly S. K. C. System

This was followed by the invention of an alternating-current generator by Mr. Stanley. During the years 1888 to 1890 he continued as general consulting engineer for the Westinghouse interests, severing his connections in 1890, however, to give his individual attention to designing the necessary appliances for making his alternating-current system applicable to the transmission of power. In 1890 he moved to Pittsfield, where he was already a large stockholder in the electric light company, taking into association with him C. C. Chesney, and incorporating the Stanley Laboratory with a capital of $10,000. To manufacture the devices invented by this company, the Stanley Electric Manufacturing Company was also formed with a capitalization of $25,000. The latter company was later amalgamated with the General Electric interests. In the summer of 1892 Mr. Stanley's Laboratory company made an alternating-current motor, and two years later the alternating-current system of long-distance transmission of power by the Stanley invention was successfully demonstrated in Housatonic, Mass., where a plant was installed for the Monument Mills Company. In this work Mr. Stanley collaborated with Mr. Chesney and Mr. Kelly, producing the famous "S. K. C. system." Other inventions followed of condensers, two-phase motors, generators, etc., and in 1898, after much experimental work, Mr. Stanley was granted a patent for an alternating-current wall meter employing the then novel idea of magnetic suspension for its moving parts, and later organized the Stanley Electric Instrument Company.

Of recent years Mr. Stanley had been engaged in consulting work with the General Electric Company, developing an electric range designed to operate at unity load factor.

Received Edison Medal in 1913

Mr. Stanley's engineering society affiliations were numerous, both in this country and abroad, and in 1913 he was the recipient of the Edison medal, being the fourth to receive this honor.

The services of Mr. Stanley to the industry are perhaps best summed up by Prof. Elihu Thomson, who at the dinner given to Mr. Stanley on May 4, 1911, in commemoration of the twenty-fifth anniversary of the present commercial application in the United States of the transformer and alternating-current generator said: "Mr. Stanley undoubtedly stands in the foreground of the application of alternating-current distribution. His little plant at Great Barrington was the first to be put in operation. It was the earliest of the kind. He stood upon the courage of his convictions. He was willing to sacrifice a great deal to show that he was right. He succeeded in doing that which he undertook to do, and from that time the art has grown very greatly."

Convention Cruise of the Missouri Association of Public Utilities

Two hundred and thirteen members and guests of the Missouri Association of Public Utilities, aboard the steamer Quincy, enjoyed the association's convention cruise from St. Louis, Mo., to Peoria, Ill., and return on May 11, 12 and 13. Among the guests of the delegates were Mayor Keil of St. Louis, the mayors of three other cities and E. W. Lloyd, president of the National Electric Light Association.

At the opening session on the afternoon of May 11, Mayor Keil welcomed the convention and its visiting members. The need for a greater organization to deal with problems of national scope was then pointed out by E. W. Lloyd. While many questions that confront electric light and power men are necessarily local, it was his opinion that others, such as rate regulation, have the same basic problems. He invited the Missouri association, therefore, to affiliate with the National Electric Light Association. President G. E. Hayler, Jr., Joplin, in his response to these addresses, summarized the progress of the Missouri association during the past year, pointed out the growing demand for electrical power in the larger industries, especially in the metallurgical field, and spoke of the need for a standard set of clearances. In closing, he suggested that the next administration investigate the feasibility of affiliating with the N. E. L. A.

Two papers on electric rates were presented. In the first, "An Outline for the Determination of Rate Schedules," by J. A. Whitlow, member of the Public Service Commission of Missouri, the records of a utility in a small city were taken as a basis and a schedule of rates derived from them. It was the speaker's aim in the paper, he said, to provide an outline or a key to the development of a schedule of rates that would be appropriate and applicable to individual local conditions in accordance with standard practice at this time.

V. C. Board, rate engineer for the Doherty Operating Company, in a paper entitled "The Minimum Charge for Electric Service," explained the Doherty theory of cost analysis as it is applied to rate-making, working out in detail the problem for one company.

J. C. Thirlwall of the railway and traction department of the General Electric Company, Schenectady, N. Y., after presenting an illustrated talk on the electrification of the mountain division of the Chicago, Milwaukee & St. Paul Railway, explained the staggered suspension used in the power lines to prevent flashing over and to enable the carrying of higher potentials.

Industrial Heating, Steam Heating and Coal

Henry O. Loebell, in the paper entitled "The Industrial Heating Business as a Factor in Central Station Development," defined the industrial heating business as "that portion of the central station output which is used for heating purposes in the manufacturing industries, and which enters as an item in the cost of production." After outlining the problem of selling both gas and electricity for this purpose, Mr. Loebell summarized the principles to be kept in mind when considering electric heating as follows: First, almost any range in temperature may be obtained regardless of the quantity of heat; second, any quantity of heat can be obtained regardless of temperature with very small temperature differentials; third, due to its physical nature, the problem of ventilation is entirely eliminated with electric heating. For these reasons electricity can be and is supplied successfully to a great number of heating operations, and is sure to become an important outlet for central station energy.

The tenor of J. B. Wooten's paper on "The Fallacies

of Municipal Electric Light Plants" was summed up in his closing sentence, quoted from Robert DeMars: "Public ownership or socialism is only possible when the earth's people are far enough advanced so that the gentleman who has the duty of collecting the fares in your public conveyances is not under the necessity of ringing a bell to announce to all within hearing that he has come into possession of a 5-cent piece that does not belong to him."

H. C. Kimbrough, American District Steam Company, championed steam heating as a profitable auxiliary to an electric central station investment. As the basis of his discussion he took data from a typical heating plant serving 247 customers and having a connected load of 818,000 sq. ft. of radiation serving 80,000,000 cu. ft. of space.

W. D. Stuckenberg, president of the Commercial Testing & Engineering Company, Chicago, showed that tests of composite coal samples properly selected are very representative of the fuel a consumer receives.

THE FUTURE STREET LAMP

In the absence of C. E. Stephens, Westinghouse Electric & Manufacturing Company, his paper, "The Future Street Lamp," was read by W. P. Hurley. The author predicted that the future possibilities for improvement in street lighting would be greater in the chemical than in the physical field. In conclusion he said: "Consideration of past developments and the present status of the arc and incandescent lamp leads us to believe that there is a field for both types of illuminants which will become more clearly defined as their advantages and requirements are more commonly known. The arc-lamp efficiency for large units is unequaled. In common, however, with any more or less intricate mechanism, it requires the care of trained men to obtain the highest utility. The incandescent lamp is unparalleled for service where small units are required, or for installations depending upon the services of men devoting the major portion of their time to other work or without mechanical experience. In large units their renewal cost undoubtedly is greater than the maintenance cost of the modern arc lamp, but this alone is not the criterion. The use of series systems must extend greatly as the relatively increased efficiency of series incandescent lamps, as well as the ease of their control, becomes better known."

At the executive session on the last day of the convention the following officers for the ensuing year were chosen: President, Hugo Wurdack, Light & Development Company of St. Louis; first vice-president, Bruce Cameron, United Railways Company, St. Louis; second vice-president, J. H. Van Brunt, St. Joseph Railway, Light, Heat & Power Company, St. Joseph; third vice-president, J. M. Scott, Kansas City Gas Company, Kansas City; secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Company, St. Louis.

Transformer Equipment of Substations at New Chicago Works of Crane Company

The engineering features in connection with the furnishing of electric service to the new works of the Crane Company, Chicago, from the system of the Commonwealth Edison Company were outlined in the April 22 issue of the ELECTRICAL WORLD. It was pointed out that each of the six industrial substations is composed of two parts, the transformer room and a switchboard room. The former is a separate building erected adjacent to the main building and contains the Commonwealth Edison transformers and incoming circuit oil switches. In view of the fact that a statement appeared in the article crediting the General Electric Company with furnishing all of the electrical equipment for the Crane Company's works, it should be pointed out that the transformer-room equipment is not considered a part of the Crane Company's installation. These six substations at present contain transformers with a combined rating of 5950 kva., including twenty 200-kva. and five 150-kva. units made by the Pittsburgh Transformer Company, and six 200-kva. transformers made by the General Electric Company. Energy is supplied by the Commonwealth Edison Company for power and lighting over 12,000-volt lines and stepped down through the aforementioned transformers for operating plant equipment as outlined on page 922 of the April 22 issue.

Ohio Commercial Men Discuss Timely Topics

With emphasis laid on the very timely subjects of electricity for cooking, heating and ice making, and of the electric motor as a successor of the gasoline engine, the new-business co-operation committee of the Ohio Electric Light Association on May 12 held a very enthusiastic and successful annual convention at the Warden Hotel, Newark, Ohio.

H. B. Craft of the Columbus Railway, Power & Light Company, in a paper on "Motor Drive as Against Gas Engine Drive," pointed out that the electric motor in the matter of initial cost, flexibility, maintenance, fire hazard, cleanliness and other features is easily the superior of the gas engine, and asserted that these facts far more than outweigh the slight difference between fuel and power bills.

The discussion was animated and brought out the fact that the small single cylinder engine uses 35-40 cu. ft. of gas per kilowatt-hour, while the best results obtained with the multi-cylinder type was 20 cu. ft. per kilowatt-hour with gas of about 1020 B.t.u. In a case cited it was found that the actual gas bills amounted to only $450 per year, but a close examination of the books showed a total fuel and maintenance cost of $1,450; moreover, the gas engine gave a speed variation of the line shaft of 6.5 per cent either way. This was replaced by an electric motor which cut this variation down to one-half of 1 per cent and operated for $1,500 a year.

A paper by C. M. Gilbert, sales manager of the Huetteman-Kramer Company, Detroit, Mich., dealt with the advantages that will accrue to both the central station and the compression ice-machine manufacturer by co-operative effort on the part of both in the installation of electrically-driven ice plants. In the subsequent discussion it was brought out that many ice-machine manufacturers are merely lukewarm in this regard and that in some instances are actually antagonistic toward the central station. At Cincinnati, Ohio, the ice company operates twenty-two plants, one of them an electrically-driven, raw water plant, which they found produced ice for 5 cents a ton less than the other plants.

In response to a request, Mr. Gilbert pointed out the following arguments against the absorption and in favor of the compression type of ice machine. Of all the machines installed 90 per cent belong to the latter class. The absorption plant requires three times as much water and it must be quite cold. The life of the ammonia pipes in the compression type is twenty years, whereas in the absorption type it is only three years. Finally, the initial cost of the absorption plant is generally the higher.

In a paper on "Industrial Electrical Heating Appliances" Mr. McKinney of the General Electric Company dealt with the advances in different applications of

electric heating, with special emphasis on the present status of electric baking of enamel and japan on automobile parts and similar work. In a given case the time of baking on this kind of work was cut from six hours necessary with gas to one and a half hours with electricity, and the resultant finish was of a higher grade. The discussion covered the general field. The possibilities of bread baking were reviewed and figures were cited on a small oven. Oil heating and steel tempering were also mentioned. It was suggested that at the request of the central station a manufacturer's representative visit the prospects for such types of installations.

Dexter Rollins of the Simplex Electric Heating Company presented a paper reviewing the merits of the different appliances of his company and asserted that a first-class appliance, even at the necessary higher price, is a much better proposition for the central station than a cheaper device which quickly fails. The question of water heating in connection with domestic electric ranges caused considerable discussion. It was brought out that some companies are giving on water heaters a rate of $1 per month per kilowatt. These are connected in parallel with the range by a two-way switch to limit the demand. The tendency of the larger companies seems to be toward a single meter for both lighting and cooking. The regular sliding power rate rather than a special cooking rate appeared more common.

J. E. Swan of the Hotpoint Electric Heating Company explained the work being done by the co-operative bureau of his company to aid central stations in every possible way to sell electric heating devices. H. G. Hopkins of the Westinghouse Electric & Manufacturing Company reviewed the new heating appliances being placed on the market by this company and described the methods and results of several successful appliance sales campaigns.

R. E. Woolley of the Standard Electric Stove Company made a point of the fact that every use of electricity can be supplanted by gas at a lower cost for fuel, but in no other field than cooking is this fact a predominant argument against electricity; therefore, why should an attempt be made to sell electric cooking on a basis of price competition with gas. He also stated emphatically that for the present electric ranges will not be bought, but must be sold.

New York Edison School Graduation

Commencement exercises for the graduating class of the New York Edison Company's Commercial School were held on Wednesday, May 10, at the company's auditorium. Dr. Charles P. Steinmetz addressed the sixty members of the graduating class on "Educational Requirements in Modern Industry." F. C. Henderschott, manager of the bureau of education, also addressed the graduates. The prescribed course of lectures and studies of the school extends over a period of two years and embraces a broad variety of subjects.

Of the sixty graduates, forty-five are employees of the New York Edison Company, six of the New York & Queens Electric Light & Power Company, four of the Westchester Lighting Company, two of the United Electric Light & Power Company, and three from the Yonkers Electric Light & Power Company. Ten of the students were awarded class "A" diplomas and the accompanying gold insignia for special proficiency in their studies throughout the course. Seven of the class "A" awards were to New York Edison Company employees and three to employees of the New York & Queens Company.

This is the fifth annual graduating class of the New York Edison Company's Commercial School and, including members of this year's class, the total number of graduates is approximately 300.

Public Service Commission News

California Commission

In granting authority to the Pacific Gas & Electric Company to lease to the Sierra & San Francisco Power Company certain electrical equipment which it has installed on the latter's property to take care of the exposition load, the Railroad Commission ordered a new lease to be drafted, refusing to recognize one drawn up on Jan. 13, 1916. The lease drawn earlier in the year was made without having first obtained the commission's authority for its execution.

Although the lease contained the following clause: "It is mutually agreed by and between the parties hereto that they will forthwith make joint application to the Railroad Commission of the State of California for an order of said commission authorizing the execution of this lease, which shall not become effective until such order shall be made by said Railroad Commission," under the provisions of Sec. 51 of the public utilities act, the purported lease is void; and the commission held that it could not revive a void instrument. The commission believed, however, that the proposed lease will be advantageous to both applicants, and the execution of a new lease embodying the material terms and conditions of the void lease was authorized.

Wisconsin Commission

Volume 16 of the Railroad Commission Reports, containing decisions rendered from Feb. 10, 1915, to Nov. 15, 1915, has just been published.

Missouri Commission

Volume 2 of the Public Service Commission Reports, containing orders delivered from Sept. 25, 1914, to Dec. 31, 1915, has just been issued.

Maryland Commission

Attention of the Maryland Public Service Commission was called last week to the alleged efforts of the Mayor and City Council of Frederick to establish a municipal lighting plant that would invade the commercial field in that city. The letter was from Emory L. Coblentz, president of the Hagerstown & Frederick Electric Railway Company, which operates in that field. On petition of 125 citizens of Frederick an injunction was obtained on May 13 against the erection of the plant, and the Public Service Commission will take no action until the courts reach their decision. Under the service laws a municipality need not apply to the commission for the right to do city lighting, but it is not allowed to enter the commercial field without the permission of the commission.

The report of the Public Service Commission for the year 1915 has just come off the press and is being distributed.

New York Commission

The applications of the Newtown Gas Company, the Woodhaven Gas Light Company, the Richmond Hill & Queens County Gas Light Company and the Jamaica Gas Light Company for further hearings in the gas rate cases against the four companies have been denied by the Public Service Commission for the First District. The final opinions in these cases have been prepared, and it is expected that the commission will render its decision in a short time. The companies maintain that conditions have materially changed since the introduction of testimony, that labor has increased in price, and that cost of materials has advanced.

Federal Government Large Buyer of Incandescent Lamps.—The federal government annually purchases in the neighborhood of 1,250,000 electric incandescent lamps.

Ohio Tax Commission Increases Valuation of Cleveland Electric Illuminating Property.—The Ohio State Tax Commission has announced that the valuation of the property of the Cleveland Electric Illuminating Company has been fixed at $20,014,380, in comparison with $19,097,830 in 1915.

Junior Electrical Engineer Wanted.—The United States Civil Service Commission on June 21 will examine applicants for the position of junior electrical engineer in the Bureau of Mines, Pittsburgh, Pa., at a salary ranging from $960 to $1,200 per annum. Applicants should apply for Form 1312.

Delinquency in Paying Light Bills to Be Made Unlawful.—A large increase in delinquency in payment of light bills caused the commissioner of water and light of Kansas City, Kan., to ask for, and receive, an ordinance requiring payment of a penalty on overdue bills. The city owns a water and electric plant.

Opening of New Buildings at M. I. T.—The corporation and faculty of the Massachusetts Institute of Technology have issued invitations to the opening of the new buildings of the Institute on Charles River Esplanade, Cambridge, Mass., on June 14. The buildings will be open for inspection in the afternoon from 2.30 to 6 o'clock. Dedicatory exercises will be held at 3 o'clock.

New Electrical Code for Cleveland, Ohio.—Through the co-operation of City Electrician E. W. P. Smith, the Electrical League of Cleveland, the Electrical Contractors' Association and the International Brotherhood of Electrical Workers No. 38, an electrical code has been formulated for the city of Cleveland and is just off the press. Work had been going forward on the code for more than a year.

Fail to Exercise Privileges, Must Surrender Franchises.—Because they failed to exercise their charter privileges six electric light companies were directed recently by the Dauphin County (Pa.) Court to surrender their franchises. The concerns are the Citizens' Avoca Light, Heat & Power Company; Pittston Electric Company; Lackawanna Electric Company; Piedmont Electric Company; Gordon City Electric Company and Pittston Heat & Power Company.

Must Try Transformer Suit Again.—Judge Hook, in the United States Circuit Court of Appeals at St. Paul, on May 3, for the third time, remanded for a new trial the case of the Westinghouse Electric & Manufacturing Company versus the Wagner Electric Manufacturing Company for alleged infringement of patents on transformers. The case has been in litigation since 1900. The district court three times in succession awarded the Westinghouse Company $10,000 for loss of profits, though Special Master Henry H. Dennison, in 1908, found that the Westinghouse Company was entitled to recover $132,435.35 from the defendant.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

St. Louis Power Company's Employees Drill.—Several hundred young men employed at the Union Electric Light & Power Company will soon be drilling in uniforms furnished by the company and with rifles furnished by the United States. The idea originated with A. C. Einstein, vice-president and general manager of the company.

Southern Doherty Men Meet in New Orleans.—The engineers and superintendents of the Doherty properties embraced in the southern district held a four days' session at New Orleans from May 11 to 14. This will enable those who will attend the N. E. L. A. convention at Chicago to participate in both conferences.

Owners of Bonus Stock Held Liable to Assessment for Bonded Indebtedness.—H. H. Haines, referee in bankruptcy at Hamilton, Ohio, has held in the case of the Hamilton Gas & Electric Company, bankrupt, that holders of bonus stock issued by the company are liable to an assessment of $100 per share for the payment claims of bona-fide bondholders and material men.

Louisville Company Wins Organization Tax Case.—The Louisville Gas & Electric Company has won a decision in the Kentucky Court of Appeals upholding its contention that it need not pay an organization tax, of one-tenth of 1 per cent on its capitalization, except as it exceeds the aggregate capitalization of the consolidated companies. The State will therefore refund nearly $8,000.

Illinois Professor to Study Stresses in Boiler Heads.—Prof. G. A. Goodenough of the department of mechanical engineering of the University of Illinois, has undertaken an analytical study of the stresses in convex boiler heads, and it is expected that actual experimental work to verify the analytical results will be undertaken by Prof. H. F. Moore of the department of theoretical and applied mechanics. It is hoped that this investigation may lead to a safer design of boiler heads.

Street Lighting System to Give Special Attention to Churches.—Special attention will be given to churches when the City Commission places the 185 additional lamps which are called for in the new contract for street lighting with the Knoxville Railway & Light Company. Commissioner Hill has pointed out that there are usually large numbers of people who congregate around church entrances at service times and that it is important the premises be well lighted. The commissioners will place the new lights after a series of night visits.

Galvanometer Design.—The relations between performance and construction constants of galvanometers are discussed and illustrated by concrete examples in a scientific paper No. 273, just published by the Bureau of Standards, Department of Commerce.

Wisconsin University Summer School in Engineering.—The eighteenth annual summer session of the College of Engineering of the University of Wisconsin will be held at Madison during the six-week period beginning June 26. Special courses will be given in chemistry; electrical, steam and hydraulic engineering; gas engines; machine design; mechanical drawing; mechanics; shopwork, and surveying. All courses in the University summer session are open to engineering students. For information address F. E. Turneaure, Dean, Madison, Wis.

Columbus Retrenches in Use of Energy on Down-Town Streets.—Failure of the voters at a recent election to approve bond issues for the payment of its running expenses has resulted in the city of Columbus, Ohio, retrenching in a number of ways. Among other things there will be a curtailment in the use of energy for lighting business streets. Only one of the five lights on each of the ornamental standards will be used, according to orders issued on May 4. Energy is furnished by the municipal plant and it is estimated that about $900 per month will be saved in this way.

Generating Company Loses Insurance Test Suit.—The New Orleans Railway & Light Company received a judgment in Judge King's court at New Orleans, La., for $163.83 against the Aetna Fire Insurance Company of Hartford, Conn., in its suit for $11,060.35 damages from fire in one of its plants on Sept. 12, 1912. The insurance company admitted the fire and the amount of damages set forth, but held that the amount of its liability could not be more than $163.83, alleging that the fire was caused by an electric current and that the insurance policy stipulated the company would not be liable for damage caused by lightning or artificial electrical current. The suit was a test case.

Report on Profit Sharing Published.—Publication of the report on "Profit Sharing by American Employers," by the welfare department of the National Civic Federation, which has been in preparation during the last twelve months, is announced by Ralph M. Easley, chairman of the executive council, who says: "The aim of this volume has been to give a concise, uncolored account of each plan (of profit sharing), based upon the data furnished by the respective companies, with their own comments as to its success or failure. There is included in addition, as an entirely new feature of exceptional value, a group of interesting opinions and discussions on profit sharing in theory and in practice, pro and con, by a number of prominent employers, representatives of organized labor, and special students of the subject."

Meter Committee, O. E. L. A.—On May 11 the meter committee of the Ohio Electric Light Association held its annual convention at Newark, Ohio.

Arkansas Public Utility Operators.—The ninth annual convention of the Arkansas Association of Public Utility Operators will be held at the Marion Hotel, Little Rock, Ark., on June 6, 7 and 8.

Newark (Ohio) Jovian League.—On May 12 the Newark (Ohio) Jovian League held a rejuvenation at which forty-eight candidates were initiated. The Columbus degree team officiated.

Jovian Chapter, Cleveland Electrical League.—Lamar T. Bema, director of public welfare of Cleveland, Ohio, addressed the Jovian Chapter of the Cleveland Electrical League on May 11, on the subject "Public Welfare Work."

Los Angeles Jovian League.—Alfred L. Bartlett, attorney-at-law and member of the California Assembly, spoke at the regular luncheon meeting of the Los Angeles Jovian Electric League on May 10 on the topic "Machinery of the Law."

Rochester Section, A. I. E. E.—J. H. Vail of the Rochester Railway & Light Company addressed the members of the Rochester section of the American Institute of Electrical Engineers on April 28 on the topic "Pioneer Electrical Engineering."

Utah Electric Club.—"The Fixation of Nitrogen from the Air by Electricity, from a Business Man's Standpoint," was the subject of an address by Lafayette Hanchette before the Utah Electric Club at the Newhouse Hotel, Salt Lake City, on May 11.

Worcester Polytechnic Branch A. I. E. E.—At the seventh regular meeting of the Worcester Polytechnic Branch of the American Institute of Electrical Engineers, held on May 12, graduate students and members of the senior class read abstracts of their theses.

New York Electrical Society.—At the meeting of the New York Electrical Society held on May 18, Henry Woodhouse, managing editor of *Flying*, lectured on "The Flying Machine in War and in Peace." This was the fifth of the series of "preparedness" lectures given by the society this season. The others were "Transmission Problems," by Dr. Michael I. Pupin; "The Gyroscope," by Elmer A. Sperry; "A Cruise with the Atlantic Fleet," by Frank J. Sprague, and "The Submarine in War," by Simon Lake.

American Institute of Chemical Engineers.—The eighth semi-annual meeting of the American Institute of Chemical Engineers will be held in Cleveland, Ohio, on June 14, 15, 16 and 17. During the forenoon of June 16 an excursion will be made to the lamp factory, research and engineering laboratories and glass works of the plant of the National Lamp Works of the General Electric Company at Nela Park. That evening, at the joint session with the Cleveland section of the American Chemical Society, Herman Stable, chemist and engineer for the United States Geological Survey, will read a paper entitled "Water-Powers of the United States."

Associations and Societies

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

New Jersey Utilities Association.—The New Jersey Utilities Association, in annual convention at Atlantic City, N. J., on May 9, elected the following officers: President, John A. Rigg, Camden; vice-president, Carroll P. Bassett, Summit; secretary, William H. Roth, Philadelphia; treasurer, Theodore Grayson, Philadelphia. Executive Committee, A. B. Aleem, Flemington; A. W. Cuddebach, Acquaickonock; J. P. Forsyth, Stockton; J. L. O'Toole, Trenton; Joseph Mayer, Newark; Harry Stille, Trenton; J. Fithian Tatem, Five Mile Beach; D. W. French, Hackensack; Gaylord Thompson, Philadelphia; Frederick K. Parker, Atlantic City, and J. B. Smith, New York.

Kansas City Section, A. I. E. E.—A Kansas City section of the American Institute of Electrical Engineers was organized on April 25 and the following officers were elected: Chairman, Gordon Weaver, power sales manager, Kansas City Light & Power Company; secretary-treasurer, Glenn O. Brown, laboratorian, Kansas City Light & Power Company; executive committee, A. A. Thompson, engineer, Kansas City Terminal Railway Company; J. F. Bratney, general superintendent, Missouri & Kansas Telephone Company; George C. Shaad, Kansas State University, Lawrence, Kan. Louis B. Cherry gave an address on "Electrolytic Refining of Gasoline." The next session will be held late this month.

Station-Operating Committee, O. E. L. A.—A meeting of the station-operating committee of the Ohio Electric Light Association was held in the assembly room of the Illuminating Building, Cleveland, on Thursday of this week. A. P. Lewis of the Cleveland, Southwestern & Columbus Railway spoke on "Gas versus Coal," telling why his company found it more economical to use gas than coal. Thomas G. Coghlin of the American Gas & Electric Company, Canton, presented a paper on "The Effect of the Non-Combustible Content of Coal on the Efficiency of Boilers," and W. H. Aldrich of the Cleveland Electric Illuminating Company discussed the topic "Electric versus Steam Auxiliaries." At a luncheon at Weber's Cafe, Robert F. Dennison, chairman of the smoke-abatement committee of the Cleveland Chamber of Commerce, spoke on "Co-operation Between Smoke Producers."

New York Jovians Discuss "Preparedness."—F. C. Henderschott, in charge of commercial employees' educational work of the New York Edison Company, addressed the New York Jovian League on May 17, on the subject of "Industrial Preparedness." Mr. Henderschott emphasized in particular the fact that the training of men in the principles of salesmanship in corporation schools has been an important factor in the development of industrial wealth, and pointed out that it has been this element of training which has brought Germany to second place among industrial nations, from its position as fourth a decade ago. He recounted the inception and growth of the association of corporation schools, and directed attention to the prominent position taken by electrical manufacturing and operating companies in this work from the beginning. At a rejuvenation held by the New York Jovians on May 12 thirty-six candidates were initiated by the regular degree team.

American Association of Engineers.—The first annual convention of the American Association of Engineers was held at the rooms of the Western Society of Engineers, Chicago, on May 9 and 10. The convention was a departure from usual engineering association conventions in that it was limited to a review of the work accomplished during the first year of its existence and to discussion of ways and means of promoting its objects. No technical papers were read or discussed. The constitution was amended to provide for a student membership offered to engineering students of accredited schools. This membership is offered at $3 per annum, $1 of which is devoted to the publication of the association and $2 to the promotion of student membership work. National preparedness received considerable attention, and resolutions were adopted to call upon the Government for blank forms for the registration of the qualifications in order that the engineer may be advised by the Government as to where he can best serve his country. The resolutions also call upon the Government to arrange to co-operate with the various engineering associations which are willing to prepare. The need for accurate military maps of the United States was clearly brought out at the banquet on May 9. A committee was appointed to make a study of this matter and to make recommendations as to how the American Association of Engineers may be of assistance. The association now has over 700 members, of which approximately 400 reside in and near Chicago. It has increased its office space three times during the year. Its work in interchanging information between engineers who were out of employment and the filling of vacant positions in the engineering field has been very large. Since Sept. 15 it has offered more than 350 positions to its members and other engineers. One new national director, W. J. Mauer, was elected to serve four years, and a national auditing committee, composed of Samuel Moreell, Jr., T. J. Mullin and C. Gaensslen, was elected. The national officers for the coming year are: President, Garrison Babcock; vice-president, T. B. Lambert; secretary, Arthur Kneisel; treasurer, O. F. Gayton; A. H. Krom and W. J. Mauer, directors. The association's new national headquarters are at 29 South La Salle Street, Chicago, Ill.

FINANCE, COMMERCE AND INDUSTRY

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

For Standardization and Better Cost Accounting

President Wilson, in Letter to E. N. Hurley, Vice-Chairman of the Federal Trade Commission, Points Out Factors Which Will Gain for American Industry a Larger Place in the World's Markets

Increased efficiency in production, closer co-operation between trade bodies, better accounting and cost-keeping methods for the retailer and small manufacturer, and judicious standardization of materials, methods and products were mentioned by President Woodrow Wilson in a letter addressed to Edward N. Hurley, vice-chairman of the Federal Trade Commission, as elements which can be made to render the trade of the United States a larger factor in the world's markets of the future.

In commenting on the work which the Federal Trade Commission has been doing to co-operate with American business men for the improvement of their business methods, and to encourage merchants' associations, commercial clubs, manufacturers' organizations, and other similar trade bodies, the President wrote:

"My Dear Mr. Hurley—Your Boston speech is before me, in which you outline some of the work which the Federal Trade Commission is doing for the business men of the country. I wish to commend your efforts generally and in particular your endeavor to assist the small manufacturer and merchant to better his condition by helping him to improve his cost accounting and bookkeeping methods.

"This is a step in the right direction and one of the main fundamentals of any successful business. It is most important to the future success of a business man that he should know what his goods actually cost to manufacture and to sell.

"If he has these facts, they will enable him to present a modern balance sheet to his bank and as a result he will be better able to obtain credit with which to expand and develop his business.

"Your suggestion that trade associations, associations of retail and wholesale merchants, commercial clubs, boards of trade, manufacturers' associations, credit associations and other similar organizations should be encouraged in every feasible way by the Government seems to me a very wise one.

"To furnish them with data and comprehensive information in order that they may more easily accomplish the result that they are organized for is a proper and useful Government function.

"These associations, when organized for the purpose of improving conditions in their particular industry, such as unifying cost accounting and bookkeeping methods, standardizing products and processes of manufacture, should meet with the approval of every man interested in the business progress of the country.

"Too much emphasis cannot be placed on your suggestion that materials, methods and products in industry should be standardized upon the basis of specifications drawn up in friendly co-operation with engineering societies, industrial experts and trade associations.

"Further standardization in our industries will not only reduce the cost of production, but assure the producer better materials and more efficient workmanship, and to the consuming public the manifest benefit resulting in not having to pay for a wide increasing variety of products and materials.

"Judicious standardization also means a greater return on a given investment.

"Capital now tied up because of inefficient methods will be released and can be used effectively elsewhere.

"If we are to be an important factor in the world's markets we must be more thorough and efficient in production. The encouragement of trade associations and standardization and the installing of better cost accounting methods in our business concerns will go a long way toward accomplishing this end.

"It is my hope that, in addition to the other work which the Federal Trade Commission is doing it will ascertain the facts regarding conditions in our various industries. If it finds that an industry is not healthy it should, after carefully considering the facts in co-operation with the parties interested, suggest a practical and helpful remedy. In this way many of our difficult bushiness problems might be solved.

"I am very anxious to see you continue to co-operate with the business men of the country along the lines upon which you are working.

"Cordially and sincerely yours,
WOODROW WILSON."

Co-operation for Export Trade

Recommending the immediate clarification of the law so as to permit co-operation among Americans for export trade, the Federal Trade Commission, after having made a careful investigation of the competitive conditions affecting American concerns in international trade has urged upon Congress the enactment of declaratory and permissive legislation. The commission found as a result of its investigation that the other nations enjoy marked advantages in foreign trade, from superior facilities and more effective organizations, and that doubt and fear as to legal restrictions prevent Americans from developing equally effective organizations for overseas business.

Foreign nations have established banking houses in every country and have dotted the map of the world with foreign trade banks of their own, enabling their merchants to extend credit and finance their transactions. Recently American banking interests have awakened to this condition and are now remedying it.

In seeking foreign trade American manufacturers and distributers must be able to meet aggressive competition from powerful foreign combinations often international in character. Foreign business men are frequently aided by their governments in developing international trade.

In Germany, prior to the war, there were 600 important cartels, *i. e.*, combinations to control the market—embracing practically every industry in the empire. Many dominated the export trade of their industries and carried on vigorous campaigns to extend their foreign business to prevent competition among German producers in foreign markets and to secure profitable prices. The manufacture and exportation of electrical equipment has been made one of the bulwarks of German foreign trade by two great companies, the Allgemeine Electricitats Gesellschaft and the Siemens-Schuckert interests with numerous subsidiaries at home and abroad working in harmony with each other. Half of the $150,000,000 worth of coal and coke exported annually was sold by one central selling agency, maintained by the great Rheinisch-Westfalische coal syndicate, and practically all the iron and steel export business was handled by a single selling agency, the Stahlwerks Verband.

In France, Belgium, Italy, Russia, Austria-Hungary, Switzerland, Sweden, Greece, Argentina, Chile, Ecuador and Japan, central organizations unite the interests of producers in various industries.

The great coal export business of England is run by powerful organizations combining all branches of the industry, thus giving British coal its grip on the rich South American market. Recently, a large number of large British manufacturers of machinery of all sorts have formed the Representation for British Manufacturers, Ltd., an organization to handle all their business in certain important foreign markets and to carry on an aggressive campaign for its extension. In the electrical and various other industries strong associations and combinations have for a long time been important factors in the foreign and domestic business of Great Britain. The Wholesale Co-operative Societies, Ltd., an astonishingly comprehensive wholesale buying organization, maintained by 1400 co-operative societies in Great Britain, has one buyer in New York who annually purchases millions of dollars worth of American products.

Combinations of British coal brokers fix the contract price for bunkering ships at Newport News. Four London firms, known as the Fixing Board, daily set the price of silver for the world and American mining companies must sell their silver for either the English or the great Indian market to one of these four houses. For years the copper trade of the world has been ruled by a vast German metal-buying organization centering in the Metallbank und Metallurgische Gesellschaft A.G. of Frankfort on the Main. This combination has subsidiary and affiliated companies in Europe, Africa and Australia, controls coper and lead mines and smelters in the United States, Mexico and other countries, and works in agreement with other German metal-buying concerns. These combinations constantly make individual American producers bid against each other, and are thus able to buy at prices near or below the cost of production.

Two chief dangers from co-operative export organizations of American manufacturers and producers are apparent. They may be used to exploit the home market, and they may be used unfairly against individual American exporters in foreign trade.

The commission is confident that the dangers in co-operative action can be fully provided against without sacrificing the essential advantages of joint action and without altering the policy of our anti-trust laws or interfering with their enforcement. Specific extension to export trade of the law against unfair competition and requirement of full reports to the Federal Trade Commission from co-operative export organizations will protect, it is held, the individual exporter, while the enforcement of the anti-trust laws will prevent the use of such organizations to effect restraint of trade or monopoly in the domestic market.

To Form Federation of Employers

The National Association of Manufacturers at the final session of its three-day convention in New York on Wednesday accepted the proposal for the establishment of a national federation of all employers in America. It is hoped to include in its membership the employers of practically all of the 8,000,000 workers in the country.

The objects of the federation will be to present a solid front to the American Federation of Labor in battles between capital and labor; to present to lawmaking bodies the consensus of opinion of the business men of the country and to encourage foreign trade. The action of the association was taken in the form of a resolution. The details of the establishment of the federation will be left to the executive board to work out.

In making a plea for a nation-wide organization of employers, not confined to any craft or exclusively to manufacturers, but one to which all employers of labor should be eligible, Col. George Pope said:

"After the war, millions of men liberated from the armies must seek a living in industrial work. To prepare ourselves for this condition there must be a new accounting of costs in our labor market. I am of the opinion that good to our nation will come out of the present world conditions, and that eventually our industries, so far as the world's market is concerned, will be on a stronger and better footing than ever before."

The association adopted resolutions favoring legislation simplifying the work of the Interstate Commerce Commission; favoring legislation to permit sufficient earning by railroads to attract investment for the development of transportation facilities and the exploration of regions not now surveyed by railroads, and expressing the belief of the association in the necessity for "a broad, patriotic plan of military and naval preparedness, based upon the opinion and judgment of army and navy experts."

Charles J. Graham, president of the American Hardware Manufacturers' Association, told the convention that the industrial and commercial problem facing the country was the question of proper railroad legislation. He said something should be done to allow the carriers remuneration for the vast expenditures necessitated by the service demanded today.

Alfred Reeves, general manager of the National Automobile Chamber of Commerce, told what co-operation had done for the automobile business. He described in detail the cross-licensing patent agreements now operative among eighty-two automobile manufacturers who license one another under patents of a general nature, leaving room for individual development of special ideas.

Accident Prevention Campaign for New York

As a beginning to a vigorous accident-prevention campaign in the 55,000 factories of New York State, the State Industrial Commission has sent special instructions to factory inspectors, informing them that the safeguarding of factory machinery would minimize the present losses of hundreds killed and crippled annually.

The commission points out that of the three general groups of factory machinery, three-fourths of all accidents are connected with working machines, one-eighth with conveying or hoisting machines, and one-tenth with power-transmitting machines. But of fatal accidents, which represent the extreme of seriousness, one-half are connected with conveying and hoisting machinery, one-fourth are connected with power-transmitting machinery, and one-fourth are connected with working machines. Or, comparing fatal with all accidents, it is found that among accidents connected with conveying and hoisting machinery, one in forty-five is fatal; power-transmitting machinery, one in sixty-eight is fatal; working machines, one in 578 is fatal.

The instructions continue as follows:

"The labor law requires the guarding of machinery in the factories of this State. It is the duty of the factory inspectors to enforce this law. No work of an inspector can be more important than this. It is literally life-saving work, for in the four years 1911-1914 no less than 457 employees in this State lost their lives as the result of accidents connected with factory machinery, an average of 114 per year, or more than one in every three working days. It is also the work of saving employees from being crippled, for in a single year (1912) at least eighty-eight workmen are known to have been crippled in connection with factory machine accidents, to the extent of the loss of a hand, arm, foot, leg or eye, and 1458 others lost fingers or toes. Or, again, besides the saving of life and limb, this is a work of important economic saving, also, for incomplete figures for 1913 show 4177 accidents connected with factory machines, in which employees suffered injuries which are compensatable under the present compensation law, and for which the total cost of such compensation, figured at the average for the first nine months' awards under that law, would have been nearly $900,000, and this is nowhere near all of the economic loss, because it includes only compensatable cases, and only two-thirds of the wage loss in those."

Higher Prices Responsible in Part for Increased Exports

High prices are largely responsible for the increase in stated value of the exports of the United States. While it is a fact that the total value of exports in the current fiscal year is 50 per cent greater than those of the corresponding period in 1914 immediately preceding the war, it is also

true that the prices of many of the articles exported have advanced more than 50 per cent. A compilation made by the Foreign Trade Department of the National City Bank of New York shows that the export price in many articles in February, 1916, is more than 100 per cent in excess of those of the corresponding month two years ago, while in a large number of other articles the advance ranges from 25 per cent to 75 per cent.

Indeed, in many articles, the quantities exported in 1916 are actually less than those of two years ago. Of copper, for example, the total quantity of pigs, ingots and bars exported in the eight months ended with February, 1916, was 446,000,000 lb. against 632,000,000 lb. in the same months two years ago.

The total exports from the port of New York for the week ended April 29, 1916, were $30,061,801, for the corresponding week of 1915 they were $24,763,189, and for the corresponding week of 1914 they were $16,554,486. For the week ending May 6, 1916, and the corresponding weeks of 1915 and 1914 respectively, the exports from the port of New York amounted to $41,052,569, $24,532,245, $15,436,598. As with preceding weeks, the bulk of the 1916 exports for these two weeks has gone to France and England. As in the preceding weeks, South America and Central America continue to show a very gratifying increase in consumption of American-made products.

During the week ended April 29, 1916, there was exported from the port of New York electrical machinery valued at $104,916, as compared with $442,333 in the corresponding week of 1914, and the exports of copper wire were $261,211 for the week ended April 29, 1916, as against no exports for the corresponding week of 1914. For the week ending May 6, 1916, the exports of electrical machinery amounted to $118,634 in comparison with $40 355 for the corresponding week of 1914. The exports of copper wire during the first week of May, 1916, amounted to $35,926 against $6,258 for the first week of May, 1914.

Manufacturing and Industrial

The Platt Iron Works has moved its Chicago office to 1212 Monadnock Block.

Howard S. Beidleman, electrician, has moved to Euclid Hall, 2343 Broadway, New York.

The Wales Advertising Company, which is engaged in technical advertising, has moved from 125 East Twenty-third Street, New York, to larger quarters at 110 West Fortieth Street.

Allen Bradley Company.—The Allen Bradley Company has moved its Chicago office from Room 307, Webster Building, to Room 1730 at 14 East Jackson Boulevard. The office is in charge of F. L. Gohl.

King Foundry Company.—The King Foundry Company, maker of King White Way standards, has moved its Chicago office from Room 530 Monadnock Block to Room 927, in the same building. The office is in charge of E. M. Hervey.

Del Fabing, who was formerly connected with the F. R. Bryant Company, a manufacturers' agency, 516 West Monroe Street, Chicago, has accepted a position with the sales department of the McGill Manufacturing Company of Valparaiso, Ind.

The Pacific Electric Manufacturing Company of San Francisco is moving its factory and offices to 827 Folsom Street, where it will have double its former floor space and better facilities for turning out its line of pole-top switches, disconnecting switches, etc.

The Terry Steam Turbine Company, Hartford, Conn., has appointed O. E. Thomas district sales manager, with headquarters at 626 Washington Building, Los Angeles, Cal. Mr. Thomas will have charge of territory including Arizona and the southern portions of California and Nevada.

The Import Sales Company, 318 East Thirty-second Street, New York, has recently established a buying office in Kobe, Japan. The company announces that it will be glad to receive inquiries from manufacturers and others regarding raw material and manufactured articles made in Japan.

A Range Christening at the Convention.—At 12 o'clock noon, Wednesday, May 24, at booth No. 37, the electric range display of the Hughes Electric Heating Company of Chicago will be christened by Miss Charlotte Greenwood, the star in the play "So Long, Letty." The range will be called "Princess Off-Peak."

The Lansden Company, manufacturer of electric commercial vehicles, Flatbush and Nostrand Avenues, Brooklyn, N. Y., has recently appointed the following new officers: Frank S. Komp, president and treasurer; William R. Garton, vice-president and general sales manager; Newton A. Burgess, secretary. Mr. Garton's offices will be maintained at 299 Broadway, New York.

Agency Changes in Fixture Field.—Franz Brzeczkowski, president of the Moran & Hastings Manufacturing Company, Chicago, has secured the agency for the Steuben-Raymo Lighting Unit for eleven states in the Central West. This fixture is composed of calcite glass as manufactured by the Steuben Glass Works of Corning, N. Y., and the Raymo fixture. Catalogs illustrating this product will be ready for distribution about June 1.

The Domestic Engineering Company, Dayton, Ohio, has recently been formed to manufacture the "Delco-Light" generating plant developed by the Dayton Engineering Laboratories Company. E. A. Deeds is president, C. F. Kettering, vice-president; R. D. Funkhouser, secretary and treasurer, and R. H. Grant, general manager. The company has already established a new plant and is manufacturing these outfits in quantity production.

The Netherland Company for Oversea Commission Trade, 89 Weesperzijde, Amsterdam, Holland, is desirous of becoming selling agent for various American manufacturing concerns. The firm declares that it has splendid trade connections in Holland, Belgium, France and its colonies, and that it is in continual touch with the largest Dutch and Belgium firms. The concern is especially desirous of obtaining catalogs and price lists of materials.

The Reeps Manufacturing Company, 50 Church Street, New York City, has recently been incorporated under the laws of the State of New York for $25,000, and proposes to place on the market several electrical and automobile devices which it has developed. Charles S. Shuman, who at one time was connected with the Western Electric Company at Philadelphia, and later sold "Klaxon" and "Newtone" horns throughout the country, is president and treasurer of the company.

The E. S. Cowie Electric Company of Kansas City, Mo., has recently opened a new branch establishment at 1238 East Douglas Avenue, Wichita, Kan. The company is engaged in the sale and repair of batteries and other electrical equipment for automobiles. Men trained in the Kansas City shop will be sent to Wichita. C. M. Hilt, formerly purchasing agent for the Cowie company, is in charge of the new branch, where special attention will be given to tractor ignition service.

The Woodrow Manufacturing Company, Newton, Iowa, which has recently been formed, proposes to manufacture various types of electrically operated washing machines. According to a statement made by I. F. Woodrow, secretary and treasurer of the company, each member of the firm has had a large amount of experience in the manufacture of washing machines, O. B. Woodrow, president of the company, being the inventor of the first dolly-type electric washing machine. It is the intention of the company to market its machines through the hardware, implement and electrical dealers.

Large Order for Turbine Units.—The Montana Power Company of Butte, Mont., has recently placed a contract with the S. Morgan Smith Company of York, Pa., for four 15,000-hp. vertical hydraulic turbine units to operate under a head of 100 ft. These units will be installed in connection with the "Holter" development on the Missouri River, near Great Falls, Mont. The S. Morgan Smith Company is also building for the "Great Falls" development of the Montana Power Company, two 16,000-hp., vertical units, which, together with the four recently installed, will make a total rating of approximately 100,000 hp. in Smith wheels at the Great Falls plant.

The Farr-Diebold Electric Company.—Morril N. Farr, formerly in the electric service department of the Utah Power & Light Company, and P. J. Diebold, formerly in the manufacturing department of the Capitol Electric Company, have both resigned their positions and have incorporated the Farr-Diebold Electric Company with offices at 24 Richards Street, Salt Lake City. The new company will specialize in the sale, installation and repair of electrical motors and special electric equipments, which work Mr. Farr and Mr. Diebold are both particularly well qualified to handle through long experience with their former employers.

City of Norwich Orders Boiler Equipment.—The gas and electrical department of the City of Norwich, Conn., has placed an order with the Heine Safety Boiler Company, Boston, Mass., for two 490-hp. water-tube boilers to be operated at 180-lb. steam pressure and to be equipped with Heine superheaters, operated at 125 lb. superheat. These boilers are to replace two Babcock & Wilcox boilers of 225-hp. rating. The boilers are to be equipped with stokers made by the Shoemaker & Santry Company. An induced-draft fan, designed to operate at 50 per cent overload during peak hours, will also be added. Stephen J. Kehoe is superintendent of the department.

Landers, Frary & Clark.—Announcement has been made of a midsummer publicity campaign to spread the fame of "Universal electric home needs," and support the dealers who are selling the Landers, Frary & Clark product through the hot weather season. Advertising displays are to be inserted in six of the leading popular publications which present an aggregate circulation of 5,461,000, which will create a large amount of interest in the line. To aid the dealers in cashing in upon this influence, a variety of "dealer helps" have been provided for the retailer, embracing special window trims, salesmen's prizes of cash and appliances, display stands and a variety of local ad suggestions and printed matter.

The Quigley Furnace Specialties Company, 26 Cortland Street, New York, has recently been formed. The furnace specialties department of the company will be engaged in the manufacture and sale of furnace materials, equipment and appliances such as high-temperature furnace cement, insulating brick, automatic fuel-oil valves, oil gas and powdered coal burners and appliances, recording systems, etc. The engineering and contracting department of the company will be prepared to analyze and make comparative statements of operating costs of powdered coal, hand-fired or stoker-fired coal, gas and fuel oil and make recommendations as to the most economical fuel and its applications. The department will also contract for industrial furnaces.

Information Wanted on Electrical Material for Export.—The Chicago district office of the United States Bureau of Foreign and Domestic Commerce has been requested by a firm of import and export agents in Shanghai, China, to put them in touch with manufacturers of sockets, switches, wire, motors and all other kinds of electrical supplies. They also request communications from manufacturers of machines for making silk and cotton tape of various widths. Catalogs and full details are requested. Name and address, with other particulars as to other articles handled by this company, may be obtained by addressing Stanley H. Rose, commercial agent in charge, Bureau of Foreign and Domestic Commerce, 504 Federal Building, Chicago, Ill.

Deuth & Company, manufacturers and importers of incandescent lamps, now occupying the entire eleventh floor of the Fifth National Bank Building, 131 East Twenty-third Street, New York City, announce that they will remove their offices on June 1 to the Equitable Building, 120 Broadway, New York City. The company has secured a large suite of offices on the thirty-sixth floor, which will be used for the executive offices and main sales offices of the concern. The company's warehouse stock of 200,000 lamps will be carried in two warehouses in Washington Street, near the Equitable Building. James R. Coe, a former president of the National Association of Stationary Engineers of the United States, has accepted a position on the sales force of Deuth & Company. For several years Mr. Coe has been prominent in the electrical field in New York City.

W. R. Ostrander & Company, who, for the past twenty years, have been at 22 Dey Street, New York, will move to 371 Broadway on or about June 1. The change in the company's quarters has been necessitated by increasing business and the desire of the concern to obtain a more central location. W. R. Ostrander & Company is one of the oldest concerns in the electrical trade, having been formed in 1852. It was incorporated in 1904 and is engaged in the manufacturing and general supply business, specializing in bells, annunciators, fire-alarm equipment, metal shades, speaking tubes, etc. The company is also maintaining a separate factory for the manufacture of electric light sockets. The new building to which the company's establishment will be moved is of five stories and is double the size of the present quarters.

The H. C. Roberts Electric Supply Company, Philadelphia, Pa., and Syracuse, N. Y., has recently moved its Syracuse storehouse, which has been in the wholesale district of that city for some ten years, to 321 East Genesee Street, where both storeroom and stockroom will be under one roof. The building extends entirely through the block, is 120 ft. long and opens on East Washington Street. From the Washington Street entrance the company will conduct its wholesale electrical business and do all of its shipping. The Genesee Street side of the building will be equipped with a complete stock of automobile accessories, which will be sold both wholesale and retail in Syracuse, and wholesale outside of Syracuse. The company is adding one more salesman to its force, and expects to provide all of its salesmen with automobiles this summer. In the new location the company will have twice the floor space that it had in its previous quarters.

NEW YORK METAL MARKET PRICES

	May 9 — Selling Prices			May 16 — Selling Prices		
	Bid		Asked	Bid		Asked
Copper	£	s	d	£	s	d
London, standard spot	139	10	0	146	0	0
Prime Lake	29.75	to 30.25†		29.50	to 30.00†	
Electrolytic	30.50	to 31.00†		29.75	to 30.25†	
Casting	27.75	to 28.25†		27.50	to 27.75†	
Copper wire base	32.50	to 33.50†		32.50	to 33.50†	
Lead	7.50†			7.50		
Nickel	45.00	to 50.00		45.00	to 50.00	
Sheet zinc, f.o.b. smelter	25.50†			....		
Spelter	16.92½	to 17.17½†		15.42½	to 15.67½	
Tin, straits	49.75†			49.25		
Aluminum, 98 to 99 per cent	57.00	to 59.00†		57.00	to 59.00†	

OLD METALS

Heavy copper and wire	23.00 to 23.50†	23.00 to 24.00†
Brass, heavy	14.00 to 14.50†	14.00 to 14.50†
Brass, light	11.75 to 12.00†	11.75 to 12.00†
Lead, heavy	5.50 to 6.00†	5.75 to 6.12½†
Zinc, new scrap	14.50 to 15.00†	14.50 to 15.00†

COPPER EXPORTS

Total tons to May 16 9,690

†Nominal.

Corporate and Financial

American Power & Light Company, New York, N. Y.—While the European war has greatly stimulated business in the manufacturing and metal-producing centers of the United States, the reverse has been true in many of the lumber and agricultural districts, including those served by the operating subsidiaries of the American Power & Light Company, according to F. G. Sykes, president of the company, in his annual report for 1915. However, he goes on to say: "It is especially gratifying to note that in spite of the adverse business conditions in all the territory served, the combined gross net earnings have increased, thus clearly indicating that with a return to normal conditions the further growth of earnings should be very substantial. At the beginning of the European war the company had under construction projects which to complete involved an expenditure of approximately $3,500,000. The completion of these projects, together with further extensions of generating and transmission facilities and the acquisition of the Galveston Gas Company and some smaller properties, has added approximately $5,400,000 to capital account. This has increased fixed charges slightly more than the increase in net earnings during the calendar year 1915.

However, it should be borne in mind that a considerable part of the new plants are not yet being fully utilized, and a large part of the additional transmission line extensions were not completed until late in 1915." The earnings statement for the year ended Dec. 31, 1915, follows:

Gross earnings		$1,275,687
Expenses		264,638
Net earnings		$1,011,049
Interest and discounts		493,602
Net income		$517,447
Combined net surplus of the subsidiaries after payment of dividends	$193,410	
Transferred to reserve for depreciation	159,000	
Balance undistributed surplus	$34,410	
Less amount accruing to common stock not owned by American Power & Light Company	2,367	
Balance accruing to American Power & Light Company		32,043
Total net income accruing to American Power & Light Company		$549,490
Less preferred-stock dividends paid		203,734
Balance		$345,756
Common-stock dividends		328,216
Balance combined surplus		$17,540
Surplus American Power & Light Company Dec. 31, 1914		326,536
Surplus Dec. 31, 1914, of subsidiaries	$983,992	
Less amount accruing to common stock not owned by American Power & Light Company	13,092	
Balance surplus accruing to American Power & Light Company		970,900
Balance combined surplus accruing to American Power & Light Company Dec. 31, 1915		$1,314,976

Chasm Power Company, Chateaugay, N. Y.—The Public Service Commission for the Second District of New York has authorized the funding of the indebtedness of the company through an issue of $47,000 of 5 per cent first mortgage bonds. The bonds are to be sold at par and the proceeds used to refund $8,000 of outstanding first mortgage bonds, $14,000 of second mortgage bonds, to discharge various bills and accounts payable and to provide $5,000 for the cost of certain new construction.

Eastern Shore Gas & Electric Company, Laurel, Del.—The Maryland Public Service Commission has granted permission to the company to take over plants at Salisbury, Federalsburg and Cambridge, which are owned by local companies. The capital stock of these companies is owned by the Eastern Shoe Company, which seeks to reduce expenses by the operation of a central power plant at Laurel, Del. The plants of the local companies will be held as supplemental plants.

The Fontana Power Company of San Bernardino County, California.—The Fontana Power Company, a newly formed organization, has filed with the California Railroad Commission an application for authority to go into business as a public utility, to build a power plant and transmission system, to sell $350,000 worth of bonds, and to mortgage its property to secure this issue. The company also proposes to lease its properties to the Southern California Edison Company for thirty years, the latter company to furnish electrical energy from the proposed plant to a number of companies allied with the Fontana Company. The Fontana Company owns all of the issued stock of the Fontana Land Company, the Rialto Domestic Water Company and the South Fontana Orchard Company, and also a large part of the stock of the Fontana Water Company.

Merchants Heat & Light Company, Indianapolis, Ind.—The Public Service Commission of Indiana has authorized the company to issue $85,000 of stock and $340,000 of bonds, the stock to sell for not less than par value and the bonds at not less than 90. The stock issue is to be used to reimburse the treasury of the company for moneys actually spent in improvements and betterments to the company's service and to pay off existing obligations of the company, which were entered into for the purpose of financing betterments and extensions made between Nov. 30, 1915, and April 1, 1916. The bond issue is to cover contemplated expenditures. The proceeds of the stocks and bonds may not be used for any other purposes, the commissions's order sets out. The total obligations and expenses incurred between the two dates mentioned were $110,464, according to the petition filed with the commission by the company. A part of these expenditures are represented by property acquired for use in handling the city lighting contract. The additional expenditures, contemplated between March 31, 1916, and Oct. 1, 1916, will amount to $318,101, according to the petition and some of this amount will go into the municipal lighting distribution system, the company having a ten-year contract to supply the city lighting for Indianapolis. The total issue of capital liabilities of the company now amounts to $6,337,438, according to the commission's order.

Southern Illinois Light & Power Company, Hillsboro, Ill.—A block of first mortgage 6 per cent gold bonds due on Jan. 1, 1931, is being offered at 103 and interest to yield 5.70 per cent.

Illinois Traction Company, Peoria, Ill.—The annual report of the company for 1915 shows a substantial increase over last year in net receipts from electric lighting and power, notwithstanding the fact that there were many elements throughout the year not conducive to this result. At Topeka, Kan., the city commission adopted an ordinance providing for a reduction in electric lighting rates of approximately 22 per cent effective on April business. At Des Moines, Iowa, a cut of approximately 16 per cent became effective on July 1. There was an increase, however, in Topeka of 1598 customers and at Des Moines of 2165 electric lighting customers and 1400 hp. in power. A statement of the receipts and expenditures for the properties controlled by the company for the year ended Dec. 31, 1915, follows:

Earnings:		
Interurban lines		$3,559,028
City lines		2,871,035
Gas		905,703
Electric		3,325,410
Heat		317,580
Water		14,216
Miscellaneous		195,022
Total gross earnings		$11,187,994
Total operating expenses, including taxes		6,657,569
Net from operation		$4,530,425
Interest on bonds, etc		3,268,607
		$1,261,818
Less depreciation		403,610
		$858,208
Less bond discount for 1915		54,396
Surplus, 1915		$803,812

Tennessee Power Company, Chattanooga, Tenn.—Ninety-two per cent of the output of the company in 1915 was generated by water power and the remaining 8 per cent by steam power, the increase in total output over 1914 amounting to 38.3 per cent, according to the company's annual report for 1915. The maximum demand for one hour on the system was 62,000 kw. on Dec. 2, 1915, as compared with 47,600 kw. on Dec. 11, 1914. The report states that the company has passed definitely from the construction stage and the period of the upbuilding of its business to an operating property with so much business offered that the generating capacity must be increased. During the first half of 1915 the company had much greater capacity than market for its power, but the demand gradually increased, however, from the Aluminum Company and the Zinc Company, as well as for general industrial purposes in Nashville, Chattanooga and Knoxville. At the end of the year about 30,000 hp. was being delivered to the Aluminum Company, and contracts had been made for 20,000 hp. additional at higher prices than previous contracts, delivery to commence this spring. On account of the increasing demands for power and the necessity for steam reserve during the dry period of the year construction of a 10,000-hp. steam plant at Parksville was begun, and is progressing rapidly. The last contract with the Aluminum Company required the construction of a hydroelectric plant at Great Falls, the necessary financial arrangements being made in connection with the contract. This plant will have a capacity of 13,000 hp. under 110-ft. head, and the estimates and contracts call for completion in the summer of 1916. Upon completion of this plant the company will own hydroelectric plants with installed capacity of 58,000 hp., and upon completion of the Parksville steam plant will have available approximately 45,000-hp. capacity in steam, a total of 103,000 hp. With average rainfall and stream flow this combined hydroelectric and steam generating capacity, the report states,

is sufficient to supply the power required by contracts already taken. There is, however, strong probability of increased demand from several different directions. The demands of customers already on the lines are increasing rapidly, and there are many opportunities to take on additional established business. Great interest is also developing throughout the country in the use of hydroelectric power for electric reduction processes for various purposes. It is therefore probable, according to the report, that consideration will have to be given to further additions to generating capacity, both steam and hydroelectric. In this case the company will find itself, it is claimed, in an excellent position to make such additions by doubling the steam plant in Parksville, which can be done at small expense, by increasing the hydroelectric capacity at Great Falls or by constructing additional hydroelectric plants and storage reservoirs on the Ocoee River at locations already controlled. The following statement shows the results of the operation of the company for 1915 as compared with 1914:

	1915		1914	
Gross earnings		$1,066,206		$672,179
Operating expenses	$402,880		$315,084	
Rentals	181,708		105,834	
Taxes	35,800	620,388	25,718	446,636
Net earnings		$445,818		$225,543
Surplus earnings of distributing systems		58,818		12,886
Total net earnings		$504,636		$238,429
Interest	$551,476		$497,552	
Less portion properly chargeable to capital being interest on investment in undeveloped hydroelectric property	58,878	465,598	120,797	376,755
Balance		$39,038		$138,326*

*Deficit.

The Union Springs (N. Y.) Light & Power Company.—The company will add 100 kw. to its generating capacity and will discharge a mortgage indebtedness of $12,000 through an issue of $25,000 of its 6 per cent first mortgage bonds at par, just authorized by the Public Service Commission for the Second District of New York.

New Utility and Industrial Companies

The Putnam County Electric Company of Granville, Ill., has been incorporated with a capital stock of $30,000 by Sidney Whitaker, George W. Hunt and John G. Pletsch.

The Brown & Pearce Company of Rochester, N. Y., has been incorporated by W. J. Eaton, C. J. Oster and B. S. Pierce of Rochester, N. Y. The company is capitalized at $10,000 and proposes to deal in electrical appliances, household, kitchen and laundry machinery.

The Little Beaver Electric Company has been chartered with a capital stock of $5,000 to operate an electric light and power plant. The incorporators are: W. S. Craig, of New Brighton, Pa.; Dr. R. M. Patterson, J. D. Perrott, F. C. Perrott and T. M. Gilchrist, of Beaver Falls, Pa.

The Enon Electric Company has been granted a charter with a capital stock of $5,000 to operate an electric light and power plant by W. S. Craig, of New Brighton, Pa.; J. D. Perrott, T. M. Gilchrist, F. C. Perrott, of Beaver Falls, Pa., and J. E. White, of Pittsburgh, Pa.

The St. Lawrence Transmission Company of Potsdam, N. Y., has been incorporated with a capital stock of $525,000 by A. V. Davis, of Pittsburgh, Pa.; P. B. Murphy and W. E. Park, of Potsdam, N. Y. The company is a consolidation of the St. Lawrence Transmission Company and the Northern Power Company.

The Choctaw Power & Light Company has filed articles of incorporation under the laws of the State of Maine with a capital stock of $2,500,000 for the purpose of building and operating street, suburban, interurban and other railways; to generate, transmit and supply electricity for lamps, heaters and motors, and to carry on any transportation business using electricity; also to carry on a general electrical business. The officers are Sheriman I. Gould, president, and Charles H. Tolman, clerk and treasurer, both of Portland, Me.

The Randall Rotary Power Plug Company of Pittsburgh, Pa., has been granted a charter with a capital stock of $250,000 for the purpose of manufacturing and dealing in power and spark plugs for motorcycles and other vehicles. The incorporators are: J. R. Cance, H. R. Lyons, George H. Harton, T. M. Harton, D. W. King, all of Pittsburgh, Pa., and H. E. Randall of Dayton, Ohio.

The Buttner Electric Company of Worcester, Mass., has been incorporated to do a general electrical contracting business and deal in electrical supplies in Worcester, Mass., and Providence, R. I. The location of the Worcester store has not yet been decided upon. The Providence store will be at 1106 Mattison Street. The officers of the company are: Aleck A. Buttner, president; Roger M. Buttner, vice-president, both of Providence, R. I., and Edward F. Goghlin, 189 West Boylston Street, Worcester, Mass., treasurer and clerk.

Trade Publications

Lighting and Ignition Batteries.—Bulletin No. 18 issued by the General Lead Batteries Company, Newark, N. J., contains information on its Type TWL lighting and ignition batteries.

Potentiometer System of Pyrometry.—The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., has issued illustrated Bulletin No. 875 entitled "The Potentiometer System of Pyrometry."

Sockets.—Pass & Seymour, Inc., Solvay, N. Y., have issued an illustrated booklet entitled, "The Gateway of Electric Service," which contains some general information regarding the generation and transmission of electricity.

Portable Electric Tools.—The Stow Manufacturing Company, Binghamton, N. Y., has just issued a twenty-page illustrated booklet which contains information on various types of portable electric tools, motor-shaft combinations, etc.

High-Tension Switching Apparatus.—The Royal Electric Manufacturing Company has issued a thirty-two-page catalog describing and illustrating its high-tension switching apparatus and accessories designed for potentials up to 140,000 volts.

Diesel Engines.—The Busch-Sulzer Brothers Diesel Engine Company, St. Louis, Mo., has just issued a twenty-four-page booklet showing detailed photographs of the more important parts of its Diesel engines and views of many of its engine installations.

Electric Vacuum Cleaner.—The Hotpoint Electric Heating Company, Ontario, Cal., is sending out a folder illustrated in colors which contains information on its electrically operated vacuum cleaner and gives some details regarding "Hotpoint Week," July 3-8.

Water-Softening Filter.—The Permutit Company, 30 East Forty-second Street, New York, has prepared an attractively illustrated catalog which describes a water-softening filter designed for use in industrial, textile and boiler plants, laundries, hotels and private residences.

Oil-Well Motors and Insulators.—Descriptive Leaflet No. 3896, issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., contains information on and illustrations of pin-type porcelain insulators, and Leaflet No. 3827, describes oil-well motors for pumping on the beam.

Automobile Batteries.—Catalog Section SL, published by the Electric Storage Battery Company, Philadelphia, Pa., describes the Type XC "Exide" battery for automobile starting and lighting service. Catalog Section MS describes miscellaneous types of "Exide" batteries for automobile starting and lighting service.

Electrical Lighting and Wiring Devices.—The George Cutter Company of South Bend, Ind., has just issued General Catalog No. 14, which contains 120 pages of illustrations and data concerning street-hoods, brackets, mast-arms, pulleys, insulators, cross-arms, line material, mazda arcs, pendants, ornamental posts, brackets, sol-lux reflectors, fixtures, panel boards, cabinets, metering panel boards, switchboards, cut-out boxes and toggle bolts.

New England

FORT KENT, ME.—The Fort Kent Electric Company expects to install a governor on its water wheel within the next two months. M. T. Billings is superintendent.

GRAY, ME.—Plans are being prepared for the installation of electric-lighting and water-works systems in Gray.

ATHOL, MASS.—The Athol Gas & Electric Company is contemplating extending its transmission lines to Northfield to furnish electrical service there.

BOSTON, MASS.—Bids will be received at the office of the Metropolitan Water and Sewerage Board, 1 Ashburton Place, Boston. Mass., until May 22 for the purchase of about 7,000,000 kw-hours of electric energy per annum for a period of five years, beginning Oct. 1, 1916. The energy will be generated by water power at the Wachussett Dam in Clinton and will be delivered at said Wachussett Dam or near the Sudbury dam in Southboro or Framingham, as may be agreed upon. Pamphlets containing further information may be obtained at the office of the chief engineer, 1 Ashburton Place, Boston, or at the office of the superintendent of the Wachussett Department at the Wachussett dam in Clinton.

BOYLSTON, MASS.—At a special town meeting held recently it was voted to extend the town electric-lighting system, at a cost of about $1,200.

CONCORD, MASS.—The committee appointed by the town to investigate the proposal that the town should abandon the municipal electric plant and purchase energy from a private company to operate the municipal electric system has reported in favor of continuing the municipal plant.

HOLYOKE, MASS.—The Gas and Electric Light Department is considering extending the municipal electric transmission lines to Rock Valley to supply electrical service there. The extension would require about 9 miles of line. John J. Kirkpatrick is manager of the electric department.

WORCESTER, MASS.—The American Steel & Wire Company is planning to erect a two-story addition to its power plant at north works on Grove Street. F. A. McClure is engineer.

DERBY, CONN.—Preparations are being made by the Derby Gas Company to double the output of its electric-light plant on Housatonic Avenue. The plans provide for the installation of a 5000-kw. steam turbine, to replace an engine, a new boiler house addition with two new 600-hp. boilers, equipped with automatic stokers; a new smoke stack 175 ft. high and 8 ft. in diameter, will be erected.

HARTFORD, CONN.—A permit has been granted to the Hartford Electric Light Company for the construction of a brick and iron substation on Bartholomew Avenue, to cost about $66,000. The Stone & Webster Engineering Corporation of Boston, Mass., has the contract for the work.

TORRINGTON, CONN — The Westinghouse, Church, Kerr Company of New York, N. Y., has been awarded the contract for erection of a large power plant for the Coe Brass Company, a branch of the American Brass Company.

Middle Atlantic

CHATEAUGAY, N. Y.—The Public Service Commission has granted the Chasm Power Company of Chateaugay permission to issue $47,000 in bonds, $5,000 of which will be used for extensions and improvements.

CORNWALL, N. Y.—Dr. E. L. Partridge of the Palisades Park Commission has been appointed to co-operate with the town of Cornwall in providing a suitable lighting system for the Storm King Highway the entire length of the road from the Rockland County line. Messrs. Merritt and Beal of the Newburgh Automobile Club have been appointed to represent the club to see what could be done toward lighting in the Clove, or the distance between Storm King and Crow Nest Mountains.

GOUVERNEUR, N. Y.—Preparations are being made by the St. Lawrence Transmission Company of Potsdam for the erection of transmission lines to supply electricity in the towns of Rensselaer Falls and Dekalb Junction. James Daly, local manager of the company, will have charge of the work.

NEW YORK, N. Y.—Bids will be received at the office of the depot quartermaster, United States army, New York, N. Y., until May 22 for furnishing under schedule 844, two crucibles, 20,000 lb. Muntz metal, 60 brackets, one derrick, 22 electrical instruments, eight sockets and four switches.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

For further information address A. L. Smith, colonel, quartermaster corps, U. S. army, depot quartermaster, New York, N. Y.

NEW YORK, N. Y.—Bids will be received by Marcus B. Marks, president of borough of Manhattan, Room 2032 Municipal Building, New York, until March 23 for furnishing and installing electric elevator and equipment in court house located at 170 East 121st Street, borough of Manhattan. Blank forms, specifications and plans may be obtained at office of auditor, of the commissioner of public works, Room 2141, Municipal Building.

ROCHESTER, N. Y.—An order, it is reported, has been placed by the Rochester Railway & Light Company for 60,000 ft. of underground cable to be used in connecting the new hydroelectric power station to be built at the foot of the Lower Falls of the Genesee River with the new distributing station in Leighton Avenue. Energy will be transmitted at 11,000 volts.

UNIONVILLE, N. Y.—The Public Service Commission has approved the franchise granted to Ralph Y. Matthews by the village of Unionville for installing an electric-lighting system and has authorized the commencement of construction in the village.

WATERVLEIT, N. Y.—The Board of Aldermen has approved a resolution to permit the Board of Contract and Supply to enter into a five-year contract with the Adirondack Electric Power Corporation of Glens Falls to supply electricity for lighting the streets of the city and power to private consumers.

CANONSBURG, PA.—The report submitted by the lighting committee of the Chamber of Commerce recommends 17 additional lamps in the residence section and eight additional lamps in the business section of Canonsburg and five additional lamps in Houston. The additional cost would be $1,005 per year to Canonsburg and $125 to Houston. The committee finds that there would be an improvement in the lighting of the towns by substituting incandescent lamps for arc lamps.

WAYNESBORO, PA.—The Waynesboro Electric Light & Power Company is contemplating extending its transmission lines to Mont Alto to furnish electrical service there.

NEWARK, N. J.—The Roseville Improvement Association is negotiating with the Board of Works for the installation of nitrogen-filled lamps of 600 cp. on Roseville Avenue.

NEWARK, N. J.—Bids will be received by the committee on public building for elevator for the northeast wing of City Hospital on Camden Street. Thomas J. Lee, Jr., is chairman of committee, and Fred A. Phelps is architect and engineer.

NORTH BERGEN, N. J.—The New York Telephone Company contemplates laying conduits in twenty-two streets in order to place all its wires underground.

PRINCETON, N. J.—Preparations are being made by the Public Service Corporation and the Bell Telephone Company to place their wires underground on Nassau Street from Washington to Harrison Street.

ROSE SIDING, W. VA.—The Thacker Coal Mining Company has decided to abandon compressed air and is equipping the machinery in its mines for electrical operation. Energy will be supplied by the Tug River Power Company. J. K. Anderson of Charleston is president and general manager of the Thacker Coal Company.

ST. MARY'S, W. VA.—Plans are being prepared by St. Mary's Power & Light Company for construction of electric plant, to cost about $10,000. For further information address E. W. Mallory, Box 120, Parkersburg, W. Va.

WILLIAMSBURG, VA.—The City Council is prepared to grant a franchise for an electric-light and power plant, electric railway, water-works and sewer system. For further information address W. L. Jones, president of City Council.

WASHINGTON, D. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 20 for suplying to the various public buildings under the control of the Treasury Department hand, electric portable vacuum cleaners during the fiscal year ending June 30, 1917. For details see proposal columns.

WASHINGTON, D. C.—Bids will be received at the office of the purchasing agent of the Post Office Department, Washington, D. C., until June 1, for furnishing and delivering from time to time as they may be required and ordered for use in the postal service during the fiscal year ending June 30, 1917, ½-ton and 1-ton electric and ½-ton, ¾-ton, 1-ton, 1½-ton and 3-ton gasoline automobile trucks. Blank for proposals and specifications will be furnished upon application to the purchasing agent.

North Central

BELDING, MICH.—The Board of Commerce is advocating the installation of an ornamental lighting system covering 11 blocks in the business district.

CAPAC, MICH.—The Detroit Edison Company has submitted a proposal to the City Council offering to take over the municipal electric-lighting system, at $7,500, providing the city will grant the company a 30-year franchise.

MANISTIQUE, MICH.—Bids will be received at the office of Alice G. Reilly, secretary of the board of education of Manistique, Mich., until June 8 for construction of high school building; also building containing gymnasium, shop and heating plant. Bids will also be received at the same time for plumbing, heating, ventilating and electric wiring for the two buildings. Plans and specifications are on file at the office of Robinson & Campau, architects, Houseman Building, Grand Rapids, and at the office of the board of education, Manistique. Plans and specifications may be obtained at the office of the architects upon deposit of $20.

RED JACKET, MICH.—The Houghton (Mich.) County Electric Light Company is contemplating installing a new street-lighting system in Red Jacket.

ATHENS, OHIO—Bids will be received by Field Scott, director of public service, until May 27 for installing an ornamental lighting system in portions of Court and Union Streets.

CANFIELD, OHIO—The Canfield Gas & Electric Company has applied for a franchise to install and operate an electric-light plant in Canfield. W. J. Smith is president.

CANTON, OHIO—Joint application has been made to the State Public Utilities Commission to authorize the Central Power Company, formerly the Canton Electric Company, to purchase the properties of the Ohio Light & Power Company, which operates plants at Newark, Tiffin, Crooksville and other places, and the Sunnyside Electric Company, which has plants in Belmont, Jefferson and Harrison counties, 12 plants in all. The large power plant, now under construction at Windsor, near Wheeling, W. Va., will supply energy to operate all plants of the new holding company.

CINCINNATI, OHIO.—Bids will be received by Walter J. Friedlander, director of public service, Cincinnati, until May 22 for electrical and other work at a new engine house, plans for which have been prepared by Harry Hake, architect. The electrical work includes installation of connections with the city fire alarm system and lighting arrangements.

CLEVELAND, OHIO.—The State Public Utilities Commission has authorized the Cleveland Electric Illuminating Company to issue $1,000,000 in bonds, the proceeds to be used for improvements.

CLEVELAND, OHIO—Bids will be received at the office of the commissioner of purchases and supplies, Cleveland, until May 25 for engine and turbine automatic control oiling and filter system for Division Avenue pumping station, Department of Public Utilities, division of water. Specifications may be obtained at the office of deputy commissioner of water, 413 Superior Avenue, City Hall.

HAMILTON, OHIO—The City Council has authorized $19,000 in bonds for improvements to gas, electric light and water-works plants.

KINGS MILL, OHIO.—The Peters Cartridge Company of Cincinnati, it is reported, is preparing plans for the construction of a power plant for use in connection with its large plant now under construction at Kings Mills.

LANIER, OHIO—Bids will be received at the office of the clerk of the board of education of Lanier Township rural school district (post office address West Alexandria, Ohio), until Miy 27 for furnishing a 20-hp. electric generating unit driven by an oil engine, to be installed at the Lanier Township Central School Building, about 3 miles south of West Alexandria.

MANSFIELD, OHIO.—Plans have been completed by the Mansfield Electric Light & Power Company for the construction of a new power plant, to cost about $511,000, work to begin within 60 days. The company proposes to supply electricity for manufacturing plants. The County Commissioners recently granted the company a franchise to erect and maintain transmission lines throughout the county.

MARTINS FERRY, OHIO—The City Council is considering the installation of an ornamental lighting system in the business section of the city.

SPRINGFIELD, OHIO—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 8 for changes in plumbing, conduit and wiring and lighting fixtures, in the United States post office at Springfield, Ohio. For details see proposal columns.

YOUNGSTOWN, OHIO — The Western Conduit Company of Youngstown, it is understood, has set aside $50,000 for additions to certain departments of the plant, including a 50 per cent increase in the electro galvanizing department. L. J. Campbell is president of the company.

ANCHOR, KY.—The R. C. Tway Coal Company has closed a contract with the Kentucky Utilities Company of Lexington for electrical energy and will equip its mines with electrically driven haulage apparatus and mining machinery. R. C. Tway of Louisville is general manager of the coal company.

FRANKFORT, KY.—The Shelbyville & Frankfort Realty Company, it is reported, contemplates the construction of two power houses in connection with an electric railway. E. H. Taylor, Jr., is president.

HAZARD, KY.—The town of Hazard has contracted with the Kentucky River Power Company, which is building an electric power plant here, to light the streets of the town for a period of five years.

LEXINGTON, KY.—The new plant of the Blue Grass Lumber Company, now under construction, will be equipped for electrical operation. Energy, it is understood, will be purchased.

LEXINGTON, KY.—The Lexington Roller Mills, it is reported, is contemplating changing from steam to electrically-driven machinery, and will purchase energy to operate the mills.

LOUISVILLE, KY.—The Speed Realty Company of Louisville has engaged Walter G. Franz, consulting engineer, Union Trust Building, Cincinnati, Ohio, to prepare plans for a power station for a group of buildings here.

LOUISVILLE, KY.—Steps have been taken by the Fiscal Court to investigate the conditions of the present heating and power plant for the jail, court house and armory, and to secure the cost of a new plant. Captain Brinton B. Davis, architect for the Fiscal Court, is a member of the committee.

MIDDLESBORO, KY. — The Puckett Creek Coal Company is planning to rebuild its power plant, which was recently destroyed by fire.

BRAZIL, IND.—The City Council has awarded the Terre Haute, Indianapolis & Eastern Traction Company a contract for lighting the streets of the city for a period of three years.

GOLDSMITH, IND.—A company is being organized for the purpose of supplying electrical service in the towns of Normandy, Teeterburg, Ekin, Kempton, Goldsmith and probably other places, and also to the farmers residing along the line between the towns named. Arrangements have been made to secure energy either from the Union Traction Company of Anderson or the Indiana Lighting & Power Company, either at Tipton or about 1 mile north of Kempton. The present plans will require the erection of approximately 20 miles of trunk lines. The company will be capitalized at $20,000. Harry C. Canine of Goldsmith is promoter of the company.

INDIANAPOLIS, IND.—Preparations are being made by the Indianapolis Light & Heat Companuy to build a new substation at 371 South Illinois Street to take care of the electric service in the vicinity of the Union station. The plant will be equipped with two 1500-kw. generator sets, one 500-kw. generator set and a storage battery with a capacity of 20,000 amp.-hours. Work on construction of new plant will begin about June 1. The cost is estimated at about $200,000.

INDIANAPOLIS, IND.—The Public Service Commission has authorized the Merchants Heat, Light & Power Company of Indianapolis permission to issue $85,000 in capital stock and $340,000 in bonds. The proceeds of the stock issue is to be used to take up outstanding obligations and the bond issue to provide funds for contemplated expenditures for improvements, part of which will be expended for the municipal distribution system, the company having a ten-year contract for lighting the city of Indianapolis.

BUFFALO, ILL.—The capital stock of the Central Illinois Electric Company of Buffalo has been increased from $50,000 to $100,000.

CHICAGO, ILL.—At an election to be held June 1 the proposal to issue $12,000,000 in bonds for new bridges, fire and police stations, comfort stations, park improvements and electric-lighting system will be submitted to the voters.

CHICAGO, ILL.—The Commonwealth Edison Company of Chicago, it is reported, is planning to erect a power plant in the southwestern section of the city. The company has recently purchased a site of 50 acres there, at a cost of $132,000.

JOLIET, ILL.—The Illinois Light & Power Company, it is reported, contemplates the construction of an electric railway from Joliet to Kankakee. Powers & Company are said to be interested in the project.

JOLIET, ILL.—Bids will be received by the Canal Commissioners at the office of the Governor of the State of Illinois, at Springfield, Ill., until June 15 for proposals for water power lease at dam No. 1, Joliet, Ill. For deatils see proposals columns.

METCALF, ILL.—The installation of a municipal electric-lighting plant is under consideration by the city officials.

PEORIA, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 31 for installing conduit and wiring system, including lighting fixtures, in the United States post office at Peoria, Ill.

SOUTH PEKIN, ILL.—Preparations are being made by the Central Illinois Light Company of Peoria to extend its electric-lighting system to South Peoria to furnish electrical service here.

SPRINGFIELD, ILL.—Bids will be received by the Board of Administration, Capitol Building, Springfield, until June 13 for construction of new kitchen building at the Jacksonville State Hospital, Jacksonville; new gymnasium building at the Illinois Soldiers' Home at Normal. Separate bids will be received for general work, plumbing, heating and electrical work. Plans and specifications may be obtained upon written application to James B. Dibelka, state architect, 130 North Fifth Avenue, Chicago, upon deposit of $10.

CHIPPEWA FALLS, WIS.—The State Railroad Commission has granted the Wisconsin-Minnesota Company a permit for the proposed hydroelectric development of the Wissota or Paint Creek dam near Chippewa Falls. When completed the Wissota plant will supply electricity in Minneapolis and St. Paul, Minn.

DENMARK, WIS.—The New Denmark Light & Power Company has contracted with the Wisconsin Public Service Company of Green Bay to supply electricity for the village. Surveys have been completed for the erection of a 33,000-volt, 60-cycle, three-phase transmission line between Green Bay and Denmark. The Wisconsin Public Service Company, it is understood, will build a 5000-kw. steam plant.

IXONIA, WIS.—The Ixonia Electric Company, recently incorporated with a capital stock of $2,000, proposes to install an electric-light plant in Ixonia. J. G. Wittberner and others are interested.

KIMBERLY, WIS.—The Kimberly Clark Company has awarded the contract for construction of addition to power house to the Foster Construction Company, at $10,000. Equipment for plant, it is understood, will be purchased by the Kimberly Clark Company. George F. Hardy is engineer.

MILWAUKEE, WIS. — An appropriation of $40,000 of the $750,000-bond issue authorized for street-lighting has been asked by F. G. Simmons, commissioner of public works. It is proposed to use the money for the erection of emergency lamps in some sections of the city, pending the installation of the proposed new street-lighting system.

OSHKOSH, WIS.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 6 for installing conduits and wiring system, lighting fixtures, etc., in the United States post office at Oshkosh. For details see proposal columns.

SHEBOYGAN FALLS, WIS.—The town of Sheboygan Falls will take over the property of the Falls Light & Power Company on Aug. 1, to be owned and operated by the municipality. The Wisconsin Railroad Commission has fixed the value of the plant at $17,500.

HOUSTON, MINN.—The Council has granted Alvin Carlson a franchise to install an electric-lighting system in Houston.

JACKSON, MINN.—Bids will be received by S. W. Bruce, village recorder, Jackson, until May 26 for construction of additions and improvements to the municipal electric-light plant, as follows: (1) For brick and tile building; (2) Electric station equipment, consisting of one 72-in. by 18-in. fire tube boiler, set in battery with an old boiler, one concrete chimney, one 150-kva. engine-driven generator unit, additions to switchboard, etc., piping connections therefor; constant transformers for street-lighting; furnishing and erecting one 150 gal. motor-driven water-works pump, including piping connections. Plans and specifications are on file in the office of the village recorder and in the office of Earle D. Jackson, consulting engineer, St. Paul, Minn., Capital Bank Building.

MINNEAPOLIS, MINN.—The Minneapolis division of the Northern States Power Company has signed a contract with the Washburn Crosby Milling Company calling for the delivery of 46,000 hp. of energy to the Minneapolis flour mills. The contract is for a period of 15 years.

OWATONNA, MINN.—The electric plant of the Public Service Operating Company of Owatonna, was recently damaged by fire, causing a loss of about $2,000.

PINE RIVER, MINN.—The Pine River (Minn.) Electric Light & Power Company is contemplating extending its transmission lines to Backus.

ANTHON, IOWA—Bonds to the amount of $20,000 have been voted for the installation of a municipal electric-light and power plant.

BOONE, IOWA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 12 for installing a new hoistway, an electric elevator, etc., in the United States post office at Boone, Iowa. For details see proposal columns.

BOXHOLM, IOWA—The general contract for construction of high and grade school building has been awarded to the Royles Company of Onawa. All bids for electric wiring were rejected. New bids, it is understood, will soon be called for. The cost of the building is estimated at $50,000.

EARLY, IOWA.—Bids will be received by W. W. Little, secretary of board of education of the independent consolidated school district of Early, Iowa, until June 7 for the erection of a grade and high school building. Separate bids to be submitted on general construction work, vacuum cleaning apparatus, electrical work, signal system, heating and ventilating and plumbing. Plans and specifications may be seen at the office of the board of education and at the office of Reimer & Herlin, architects, Marshalltown, Iowa, copies of which may be obtained from the architects upon deposit of $15 for general work and $10 on other branches.

FORT DODGE, IOWA—Bids will be received at the office of the city clerk, Fort Dodge, until May 24 for construction of a hydroelectric plant, separate bids to be submitted as follows: (1) For construction of dam, power house and appurtenances; (2) For furnishring and installing hydraulic turbine, generator and accessories. Plans and specifications are on file at the office of W. L. Tang, city clerk, Fort Dodge, and at the office of Burns & McDonnell, engineers, Inter-State Building, Kansas City, Mo.

ROCK RAPIDS, IOWA—The Council has passed an ordinance authorizing a $15,000 bond issue to establish a heating plant and for improvements to the electric-lighting system and water-works.

KANSAS CITY, MO.—Bids will be receive at the office of the supervising architect, Treasury Department, Washington, D. C., until June 7 for resetting two boilers and furnishing and installing feed pumps, meters, regulators, separators, etc., in the United States post office and custom house at Kansas City, Mo. For details see proposal columns.

KANSAS CITY, MO.—The contract for wiring the new paint factory and warehouse of the Waggener Paint & Glass Company of Kansas City has been awarded to the Kansas City Electrical Construction Company. The contract for electrical equipment, including a 50-hp. oil engine, 35-kw., direct-current generator (directly connected), switchboard, etc., has been awarded to Fairbanks-Morse & Company of Chicago, Ill.

RIVERMINES, MO.—The St. Joseph Lead Company of Bonne Terre is contemplating the construction of a power plant at Rivermines, at a cost of about $250,000.

OMAHA, NEB.—Extensive improvements are contemplated by the Omaha & Council Bluffs Street Railway Company, involving an expenditure of $250,000, and will include increasing the output of the Lake Street substation by one-third, the purchase of new cars and extensions to several street-car lines.

RED CLOUD, NEB.—Bids will be received by the School Board, District No. 2, Webster County, Red Cloud, until June 6 for construction of a high school building. Separate bids to be submitted for plumbing, heating and ventilation, and electric wiring. Plans and specifications are on file in the office of C. J. Pope, secretary of the board, Red Cloud, and at the office of R. A. Bradley & Co., architects, Exchange National Bank Building, Hastings, Neb.

SEWARD, NEB.—Application has been made by the Blue River Power Company of Seward for permission to erect an electric transmission line (22,000 volts) to Utica, and a 2200-volt line transmission to Pleasantdale.

ELKHART, KAN.—The proposal to issue $8,000 in bonds for the installation of a municipal electric-light plant will soon be submitted to the voters.

OSKALOOSA, KAN.—Bids will be received by the city of Oskaloosa until May 29 for construction of water-works system, bids to be submitted on the following: 188 tons of cast-iron pipe, 8,708 lb. Hub end specials, 18,500 ft. 6-in. steel or cast iron pipe, 50,000-gal steel tank and tower, one 100-gal. per minute centrifugal pump and motor, 2½ miles of transmission line, valves and hydrants. Plans and specifications are on file in the office of O. W. Stiles, Bryant Building, Kansas City, Mo. W. O. Werswick is city clerk.

QUINTER, KAN.—The installation of a municipal electric-lighting plant in Quinter is under consideration.

RESERVE, KAN.—The installation of an electric-lighting plant in Reserve is reported to be under consideration.

SALINA, KAN.—Preliminary plans are being prepared, it is reported, by Paul Wakenhut, city engineer, for improvements to the municipal electric-light plant.

Southern States

CLIFFSIDE, N. C.—The Broad River Hydro-Electric Power Company, recently incorporated with a capital stock of $500,000, proposes to build a hydroelectric plant on Broad River and transmit electricity for lamps and motors in Cliffside and other cities in Rutherford County.

NEWBERN, N. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 12 for a new boiler, etc., for the United States post office, court house and custom house at Newbern, N. C. For details see proposal columns.

BAMBERG, S. C.—Bonds to the amount of $5,000 have been voted for improvements to the electric-light plant.

CROSS ANCHOR, S. C.—Plans are being considered for the construction of an electric railway from Spartanburg to Clinton, via Walnut Grove, Hobbyville, Cross Anchor and Tylersville, about 35 miles long. W. B. Patton of Cross Anchor and A. B. Calvert of Spartanburg are interested.

GREENVILLE, S. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 6 for a new boiler, etc., in the United States post office and court house at Greenville, S. C. For details see proposal columns.

CORDELLE, GA.—The proposal to issue $75,000 in bonds for construction of an electric-light and power plant and an ornamental lighting-system for the business section, will be submitted to the voters.

HAHIRA, GA.—An election will be held on May 24 to submit to the voters the proposal to issue $8,500 in bonds to install a municipal electric-light plant in Hahira.

KINGSTON, GA.—The city of Kingston has closed a deal with the Matthews Light & Power Company for the installation of an electric-lighting system in Kingston. J. R. Waldrip is representative for the company.

MIAMI, FLA.—The Miami Electric Light & Power Company contemplates the purchase of a new steam turbine of about 1500 kw. capacity. H. H. Hyman is assistant manager.

BRISTOL, TENN.—The Electric Transmission Company, operating a central plant in the Black Mountains coal fields, it is reported, has purchased equipment to quadruple the output of its plant, and is planning to erect transmission lines through Kentucky to Cincinnati, Ohio.

CORINTH, MISS.—Extensive improvements are contemplated by the Cumberland Telephone Company, to cost about $12,000, which will include a large amount of cable construction.

MAGNOLIA, MISS.—Surveys and rights of way secured are now being made by the McComb & Magnolia Electric Railway & Power Company for the proposed electric railway between Magnolia and Summit. A. S. Jones is general manager and H. W. Bell, chief engineer.

TCHULA, MISS.—The city of Tchula contemplates issuing $4,600 in bonds for the construction of an electric-lighting system; $4,000 in bonds for water-works and $5,000 for sewer system and paved sidewalks. Bids for construction will be received until June 6.

BENTONVILLE, ARK.—Improvements are contemplated to the municipal electric-light plant and water-works system, to cost about $25,000.

FORT SMITH, ARK.—The City Council has engaged the Phillips Engineering Company of St. Louis, Mo., to make a survey of the city, prepare plans and estimates and supervise the awarding of contract for construction of proposed municipal electric-light plant.

MALVERN, ARK.—Contracts have been awarded by the Arkansas Light & Power Company for rebuilding its local distribution system, work on which is already under way. J. L. Longino of Arkadelphia is secretary.

NEWPORT, ARK.—The city of Newport has granted the Newport Water, Light & Power Company a franchise to install an electric-light plant here.

RECTOR, ARK.—The Commissioners of Water Works Improvement District No. 1 have awarded contract for construction of water-works and sewers to Long & Hagerty of Bessemer, Ala., at $54,000. Size of pump not decided upon; brick power station. The pumps will be driven by electricity or oil engine.

NEW ORLEANS, LA.—Preparations are being made by the Orleans-Kenner Electric Railway Company for the construction of a substation at Kenner, to cost about $10,000. Equipment for station and material for distribution, it is understood, has been purchased.

TULSA, OKLA.—Surveys have been made for the construction of an electric railway from Tulsa to Coweta, a distance of 25 miles. H. D. Patee of Tulsa is interested.

CUERO, TEX.—The Texas Southern Electric Company is contemplating extensions and improvements to its local system, at a cost of about $10,000.

FREEPORT, TEX.—The Freeport Sulphur Company has decided to add a fourth unit to the present power plant system of the sulphur mines in Freeport. This plant will be a duplicate of plant No. 3, now nearing completion, and will develop about 13,000 hp. bringing the total output of the plants up to 36,000 hp. The Westinghouse-Church Kerr & Company, 37 Wall Street, New York, N. Y., will have charge of the work.

GALVESTON, TEX.—Preparations are being made to renew the electric lamps along the Seawall Boulevard. Ornamental standards will be erected from Nineteenth Street to Twenty-eighth Street.

HUMBLE, TEX.—The Humble Power & Ice Company is contemplating the construction of a new electric power plant and ice factory, to cost about $30,000.

TAYLOR, TEX.—The Texas Power & Light Company of Dallas is contemplating extending its service to Taylor.

Pacific States

OREGON CITY, ORE.—The Rasmussen-Grace Company, engineers, Bates Building, Portland, which has the contract for the construction of the proposed power plant, ground pulp mill, forebay, dam, headgates, etc., for the proposed addition to the Hawley Pulp & Paper Company's plant in Oregon City, has awarded the electrical contract to the General Electric Company (Portland branch) and the balance of the equipment, including turbines, gates, racks, etc., to Edward G. Gordon, hydraulic and mechanical engineer, of Portland. The cost of the plant complete is estimated at about $200,000.

SILVERTON, ORE.—At an election held recently the proposal to issue $36,000 in bonds for the installation of a municipal distribution system was defeated. It was proposed to purchase energy from a power plant at Scott's Mills. According to reports the voters of the city, in the immediate future, will undertake to establish an electric generating plant as well as a distribution system.

NOVATO, CAL.—The Pacific Utilities Company has petitioned the Supervisors for a 25-year franchise to serve the township with electricity for lamps and motors, water and telephones. The company is capitalized at $50,000 and the incorporators are: R. H. Trumbull, A. D. Scott, Frank Silva and Cain Brothers.

OAKDALE, CAL.—The Oakdale Irrigation District is now considering the establishment of a large power plant in the mountains in connection with its storage system.

OAKLAND, CAL.—Application has been filed with the State Railroad Commission by the Sierra Electric Power Company of Oakland for a certificate of public convenience and necessity, authorizing the company to construct and operate a hydroelectric plant and system under franchise granted to Albert C. Agnew by the counties of Butte, Colusa, Glenn, Shasta and Tehama. The company proposes to construct two hydroelectric plants on Digger Creek in Tehama County, and erect a high-tension transmission line through the above-named counties to a point about 4 miles from Maxwell. The transmission line will be steel pole construction, using No. 2 copper wire, with suspension type insulators. Energy will be transmitted at 66,000 volts.

SAN FRANCISCO, CAL.—Estimates are being prepared by City Engineer O'Shaughnessy of the cost of the proposed extention of the municipal street railway system from the Twin Peaks tunnel down Market Street.

YREKA, CAL.—The California-Oregon Power Company of Yreka has been authorized by the State Railroad Commission to erect transmission lines in Trinity County to supply electricity to the gold dredgers there. The company has a contract with the Yukon Gold Company on Coffer Creek and proposes to erect a transmission line from Castella. The proposed line will be from 22 to 28 miles long and will cost about $50,000.

GLOBE, ARIZ.—The Globe Light & Power Company contemplates the installation of additional machinery and equipment, to cost about $12,000.

GREAT FALLS, MONT.—A committee has been appointed by the Park Board to investigate the cost of installing ornamental lamps (similar to those used in the lighting districts) in both Gibson and Margaret Parks.

HELENA, MONT.—The City Council is considering the creation of a lighting district in the Second and Fourth Wards.

Canada

EDMONTON, ALTA.—Plans are being prepared by E. W. Bowness of the Edmonton Power Company for development of municipal power system, including railway, to cost about $500,000. The company has been awarded contract to supply the municipality with electricity.

ARTHUR, ONT.—The by-law providing for an appropriation of $15,000 for the purchase of the local electric-lighting system and for the installation of system to distribute hydroelectric power has been approved by the ratepayers.

PETERBORO, ONT.—H. O. Fisk, manager of the Peterboro Utilities Commission, has been asked to prepare a report on the installation of lamps on certain streets in North Monaghan.

RODNEY, ONT.—The by-law providing for an appropriation of $7,000 for the installation of a new distributing system to distribute hydroelectric power has been approved by the ratepayers. S. B. Morris is clerk.

ST. CATHARINES, ONT.—The City Council has passed a by-law authorizing an issue of $84,000 in debentures for extensions to the hydroelectric system.

STRATFORD, ONT.—The by-law providing $30,000 for improvements to the electric distribution system has passed the first reading in the Council.

Miscellaneous

VALDEZ, ALASKA.—The Inter-Mountain Traction & Power Company submitted the lowest bid for supplying Fort Liscum, near Valdez, with electricity for a period of 10 years.

PANAMA—Bids will be received at the office of the general purchasing offices, the Panama Canal, Washington, D. C., until June 5 for pig iron, babbitt, metal, pig tin, antimony, sheet zinc, sheet lead, lead pipe, solder, bronze bars, copper bars, sheet copper, copper tubing, copper wire, manganese-steel, bushings, journal bearings, malleable-iron castings, steel castings, coupler pins, spring plates, steel cable, cable thimbles, cable clips, turnbuckles, joining shackles, missing links, track spikes, etc. Blanks and general information relating to this circular (No. 1042) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

1,181,985. RECEIVER FOR PRINTING TELEGRAPH SYSTEMS; C. G. Ashley and E. T. Byshe, Chicago, Ill., and Toronto, Ont., Canada, respectively. App. filed July 10, 1913. Automatic system using printing characters.

1,181,988. SHIP; E. N. Breitung, Marquette, Mich. App. filed Oct. 21, 1912. Windmill drives generator and serves as auxiliary sail.

1,181,993. RAILWAY TRAFFIC CONTROLLING APPARATUS; C. J. Coleman, New York, N. Y. App. filed June 8, 1906. Reduces resistance losses in return rails.

1,181,996. MAGNETO ELECTRIC GENERATOR; R. H. Cunningham, New York, N. Y. App. filed Oct. 8, 1912. Particularly for motorcycles—operates on expansion of inclosed fluid.

1,182,000. THERMOSTATIC CONTROLLER; B. V. Edwards, Newark, N. J. App. filed March 14, 1914.

1,182,003. SIGNALING BY ELECTROMAGNETIC WAVES; R. A. Fessenden, Brant Rock, Mass. App. filed April 19, 1906. Does away with noise and inefficiency of spark.

1,182,020. ELECTRIC CONTACT DEVICE; G. L. Lang, Newark, N. J. App. filed Dec. 31, 1914. Constant contacts or speeds.

1,182,029. RAILWAY TELEPHONE AND SIGNAL SYSTEM; G. E. Neel, Abilene, Tex. App. filed Sept. 30, 1915. Intercommunication between trains.

1,182,062. ARROW LIGHT FOR AUTOMOBILES; W. H. Von Otto, Cincinnati, Ohio. App. filed Dec. 14, 1914. Arrow mounted on bulb socket.

1,182,080. ELECTRIC SWITCHING MECHANISM; E. M. Fitz, Columbus, Ohio. App. filed March 5, 1913. Particularly for car lighting.

1,182,087. ELECTRIC SWITCH; G. H. Hart, West Hartford, Conn. App. filed Oct. 29, 1914. Pendant, push button operated.

1,182,088. COMBINED LIGHTING AND IGNITION SWITCH; G. W. Hart, West Hartford, Conn. App. filed June 17, 1915. Single bolt locks bolt switcharms.

1,182,090. SPAR PLUG TESTER; A. P. Jackson, Denver, Col. App. filed March 22, 1915. Tests plugs under pressure conditions.

1,182,097. CIRCUIT INTERRUPTER; J. N. Mahoney and H. G. MacDonald, Wilkinsburg, Pa. App. filed Feb. 5, 1914. Toggle operated double-throw switch.

1,182,100. CROSSING SIGNAL; C. P. Nachod, Philadelphia, Pa. App. filed Aug. 3, 1912. Operated by approaching train.

1,182,133. TIME CONTROLLING AND RECORDING MECHANISM; A. O. Benecke, Boston, Mass. App. filed Jan. 8, 1915. Sounds whistle, predetermined times.

1,182,138. TELEPHONE RECEIVER HEAD PIECE; J. O. Bradley, New York, N. Y. App. filed June 30, 1915. Applicable to head without removing hat.

1,182,152. RAILWAY CROSSING SIGNAL; R. E. Driscoll, Omaha, Neb. App. filed Aug. 12, 1914. Swinging pendulum construction.

1,182,157. APPARATUS FOR TRANSMITTING SYNCHRONOUS MOVEMENTS BY ROTATING MAGNETIC FIELDS; R. Federico and L. Segalin, Turin, Italy. App. filed May 26, 1913. For electric clocks.

1,182,173. SILVER CLEANER; J. B. Hoen, Philadelphia, Pa. App. filed Feb. 21, 1916. Circular zinc electrode with supporting grid.

1,182,179. PERFORATOR FOR FORMING TELEGRAPHIC TAPE; C. L. and H. L. Krum, Chicago, Ill. App. filed Sept. 8, 1914. Rapid keyboard machine.

1,182,191. SUPPORT FOR INSULATORS; J. W. Malloy and J. Gilman, Sioux Falls, S. D. App. filed Sept. 1, 1915. Tie wire relieved of strain.

1,182,202. VOLTAIC CELL AND BATTERY; F. R. Parker, Chicago, Ill. App. filed Jan. 29, 1910. Small cells readily coupled one on top of the other. Thirty-seven claims.

1,182,205. COMBINED ALARM AND SIGNAL FOR WET PIPE SPRINKLER SYSTEMS; C. E. Potter, St. Louis, Mo. App. filed Jan. 30, 1915. Diaphragm under water pressure and wound clock.

1,182,206. COMBINED ALARM AND SIGNAL FOR DRY-PIPE SPRINKLER SYSTEMS; C. E. Potter, St. Louis, Mo. App. filed Jan. 30, 1915. Gives alarm and approximate location of sprinkler head.

1,182,216. MEANS FOR CONVERTING MOTION; R. A. Schoenberg, New York, N. Y. App. filed Jan. 5, 1910. Double push-button switch.

Record of Electrical Patents

Notes on United States Patents issued May 9, 1916, prepared by Mitchell & Allyn, 41 Park Row, New York.

1,182,230. ELECTRIC REGULATOR WITH SHORT-CIRCUITING DEVICE; W. A. Turbayne, Buffalo, N. Y. App. filed Jan. 9, 1912. Variable pressure rheostat type.

1,182,231. AUTOMATIC ELECTRIC REGULAR; W. A. Turbayne, Buffalo, N. Y. App. filed April 13, 1912. Prevents arcing of electrodes.

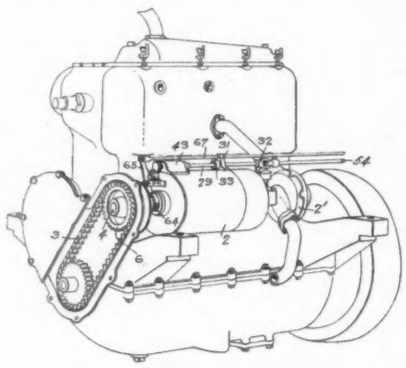
1,182,234. AUTOMATIC SWITCH MECHANISM; C. W. Wheeler, Chicago, Ill. App. filed July 14, 1909. Electromechanical interlocking.

1,182,241. AUTOMATIC POTENTIAL REGULATOR; E. H. Bendel, Oakland, Cal. App. filed Dec. 5, 1912. For switching end cells, generators, etc., in and out of series with battery.

1,182,257. STORAGE BATTERY; F. Engel, Buffalo, N. Y. App. filed Feb. 19, 1909. Particularly for car lighting.

1,182,265. ELECTRIC SWITCH AND SWITCH-OPERATING MEANS; E. L. Gale, Sr., Yonkers, N. Y. App. filed Dec. 10, 1912. For multiple-phase motor.

1,182,271. PROCESS OF MAKING RADIATORS; H. E. Hersh, Allentown, Pa. App. filed Sept. 19, 1914. Electrolytic deposit between adjoining tubes.



No. 1,182,821—System for Auto Vehicles

1,182,283. ELEVATOR GATE CONTACT DEVICE; W. D. Lutz, Allendale Borough, N. J. App. filed Sept. 25, 1911. Absolutely certain under all conditions.

1,182,290. RECTIFIER AND THE METHOD OF OPERATING THE SAME; G. S. Meikle, Schenectady, N. Y. App. filed Oct. 9, 1914. Employs a tungsten cathode.

1,182,291. RECTIFIER; G. S. Meikle, Schenectady, N. Y. App. filed May 7, 1915. Self-starting and reliable.

1,182,300. TRANSMISSION OF ELECTRICAL IMPULSES; G. Musso, New York, N. Y. App. filed Nov. 21, 1910. For telegraphic and telephonic messages.

1,182,301. TELEGRAPHY; G. Musso, New York, N. Y. App. filed May 28, 1910. Particularly for underground and submarine cables.

1,182,302. TRANSMISSION OF ELECTRICAL IMPULSES OVER CIRCUITS OF HIGH ELECTROSTATIC CAPACITY; G. Musso, New York, N. Y. App. filed May 12, 1911. Long-distance telephony.

1,182,316. SEWAGE DISPOSAL MEANS; J. W. Roche, Hornell, N. Y. App. filed Aug. 18, 1913. Employs an electrolytic wall.

1,182,329. MAGNETICALLY OPERATED DEVICE; H. F. Stratton and H. R. Canfield, Cleveland, Ohio. App. filed April 18, 1913. Means for binding the laminations together.

1,182,363. SELECTOR SWITCH; O. F. Forsberg, Yonkers, N. Y. App. filed Sept. 13, 1915. For telephone exchanges.

1,182,381. ELECTRICAL SIGNALING DEVICE; P. Kaplan, New York, N. Y. App. filed April 7, 1911. Green lamp lighted when all doors in train are closed.

1,182,399. AUTOMATIC SWITCH; M. Mintz, Rock Island, Ill. App. filed Feb. 24, 1911. Has mercury cup and swinging contact fork.

1,182,419. SPARK PLUG; C. M. Pearsall, Ridgewood, N. J. App. filed July 1, 1914. Terminal connection of sheet metal.

1,182,434. ELECTRIC HEATER AND TOASTER; C. Truitt, Pomona, Cal. App. filed Jan. 9, 1915. Arrangement of heating element and reflector plate.

1,182,438. LOCK FOR ELECTRIC SWITCHES; M. T. Whitesell, E. B. Hysell and F. Osborn, Broad Ripple, Ind. App. filed Sept. 12, 1914. For automobiles, etc.

1,182,513. BATTERY; H. G. C. Thofehrn, Pittsburgh, Pa. App. filed Feb. 13, 1915. Uniformly permeable homogeneous paste—includes insoluble salt of radium.

1,182,538. LINE CONNECTING DEVICE; A. H. Dyson, Montclair, N. J. App. filed Feb. 2, 1915. Crossbar type telephone switch.

1,182,539. ALARM DEVICE; T. N. Eatman, Hairston, Ala. App. filed Sept. 24, 1915. Low-water alarm.

1,182,656. SIGNAL; H. C. Dolan, Detroit, Mich. App. filed April 26, 1915. For automobile use.

1,182,685. CURRENT RECTIFIER; R. P. Jackson, Edgewood Park, Pa. App. filed Nov. 8, 1911. Limits current that follows a short-circuit.

1,182,688. ELECTRIC RADIATOR; J. B. Kirby, Cleveland, Ohio. App. filed Jan. 26, 1912. Immersed coils which are cut off in case of low water.

1,182,709. GAS REGULATOR FOR X-RAY TUBES; C. G. Roch, Paris, France. App. filed Oct. 25, 1915. Is without capillary tubes.

1,182,720. HAND SETTING DEVICE FOR CLOCKS; O. M. Todd, Torrenish, Wash. App. filed April 1, 1915. All auxiliary clocks set simultaneously.

1,182,726. TELEPHONE CALL SIGNAL; John J. Wetmore, Syracuse, N. Y. App. filed June 10, 1914. Adjustable retracting spring for bell striker.

1,182,729. ELECTRIC SWITCH; C. E. Anderson, Bridgeport, Conn. App. filed Dec. 18, 1915. For electrolier.

1,182,744. TELEPHONE ATTACHMENT; C. E. Booker, Suffolk, Va. App. filed May 14, 1915. For holding the receiver hook with the receiver thereon in elevated position.

1,182,759. BATTERY AND GENERATOR; P. A. Emanuel, Aiken, S. C. App. filed Nov. 9, 1915. Principle of Grove gas cell.

1,182,783. ELECTRIC CONDUIT MOLDING; O. K. Mitchell, Chicago, Ill. App. filed April 30, 1914. Made of rolled sheet metal.

1,182,817. OUTLET BOX FITTING; G. B. Thomas, Bridgeport, Conn. App. filed June 5, 1912. Special mounting of fitting on outlet box.

1,182,818. METHOD OF CALIBRATING ELECTRIC CURRENT METERS; V. H. Todd, Orange, N. J. App. filed March 4, 1914. For meters having permanent magnet and movable coil.

1,182,821. SYSTEM FOR AUTO VEHICLES; R. Varley, Englewood, N. J. App. filed April 9, 1913. Starting, lighting and ignition mechanism.

1,182,833. SIGNAL BOX; W. H. Brockway, Needham Heights, Mass. App. filed Jan. 3, 1916. Special holder for testing plug.

1,182,843. SIGNALING; R. A. Fessenden, Brookline, Mass. App. filed Sept. 5, 1913. Direction of transmission and receipt of sound signals in water.

1,128,848. DEVICE FOR COOLING ARMATURES OF DYNAMO ELECTRICAL MACHINES; E. C. Ketchum and D. H. Andrews, Boston and Newton Center, Mass. App. filed June 25, 1914. Permits leakage of the cooling fluid.

1,182,849. AUTOMATIC TELEGRAPHY; J. W. Larish, New York, N. Y. App. filed April 26, 1913. Improved contacts for perforated tape work.

1,182,867. IGNITER MECHANISM; E. C. Wilcox, Meriden, Conn. App. filed June 18, 1914. Condenser built into distributer.

1,182,868. BLOCK SIGNAL APPARATUS; F. C. Williams, Philadelphia, Pa. App. filed Dec. 9, 1908. Operates mechanically on failure of electricity.

1,182,176. REFILLABLE FUSE; O. H. Young, Milwaukee, Wis. App. filed Feb. 17, 1915. Removal of one side of casing discloses fuse and terminal connections.